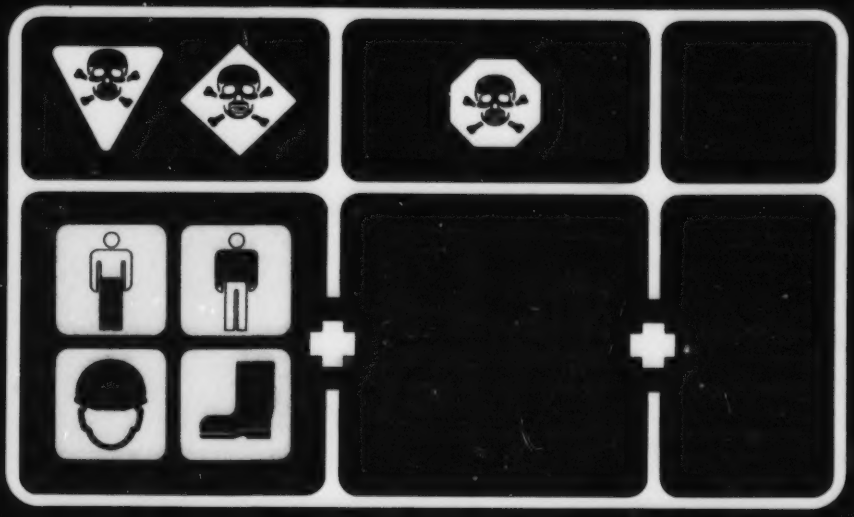

CROP PROTECTION in Alberta 1991

PART 1 CHEMICAL

Herbicides Insecticides Fungicides Rodenticides

Alberta
AGRICULTURE
AGDEX 606-1

POISON CONTROL CENTRE (ALBERTA)

Toll Free Alberta Wide
1-800-332-1414

Calgary only
270-1414

Phone Number of the Emergency Department of the Hospital in Your Area is (403) _____

WHEN YOU CALL THE POISON CENTRE

1. Remain calm.
2. Bring the container and/or label with you to the phone.
3. Be prepared to answer some questions.
   a) age and weight of patient
   b) name and amount of product
   c) time poisoning happened
   d) any symptoms
   e) circumstances surrounding the incident
   f) your name and phone number
4. Follow instructions carefully.
5. Keep your line free if the Poison Centre has to return your call.
6. **Do not attempt any additional first aid unless the Poison Centre has instructed you.**

Copies of this publication may be obtained from:

Print Media Branch
Alberta Agriculture
7000 - 113 Street
Edmonton, Alberta, T6H 5T6
or
Alberta Agriculture's district offices

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GUIDE TO CROP PROTECTION IN ALBERTA

1991

PART I - CHEMICAL

Edited by
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Crop Protection Branch
Alberta Agriculture
in co-operation with
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Ieuan R. Evans Fungicides
Robert C. Acorn Rodenticides

This publication is intended to be used as a guide only. Information contained herein is that available at time of printing (January 1991). While every effort has been made to ensure accuracy, Alberta Agriculture does not accept responsibility for label changes, errors in conversion, or otherwise.
Consult product labels, attached to pesticide containers, for final detailed instructions.
Note: Some approved minor use registrations may not appear on the product label. Check with product write-up for details.

All recommendations in this publication are given in quantity of commercial product per acre (L or kg/ac). Product labels are given in quantity of product per hectare (L or kg/ha). To avoid application errors, be sure to read and understand label recommendations.

Warning

The use of a pesticide in any manner not published on the label or registered under the Minor Use of Pesticides regulation constitutes an offence under both the Federal Pest Control Products Act and Alberta's Agricultural Chemicals Act.

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ADDRESS AND TELEPHONE NUMBERS

Chemical Companies

BASF Canada Inc.
Suite 700 - 333 - 5th Avenue S.W.
Calgary, AB. T2P 3B6
(403)237-6661

Bell Laboratories Inc.
3699 Kinsman Blvd.
Madison, Wisconsin. 53704, USA
(608)241-0202

Burlington Bio-Medical & Scientific Corp.
91 Carolyn Blvd.
Farmingdale, N.Y. 11735, USA
(516)694-9000

Ceva Laboratories & Co.
610 - 7101 College Blvd.
Overland Park, Kansas. 66210, USA
(913)451-3434

Chemagro Ltd.
Suite A, 130 Cree Crescent
Winnipeg, MB. R3J 3W1
(204)885-166

Chevron Chemicals (Canada) Ltd.
3228 South Service Road
Burlington, Ontario. L7N 3H8
(416)681-2201

Ciba-Geigy Canada Ltd.
820 - 26 Street N.E.
Calgary, AB. T2A 2M4
(403)273-5656 Toll Free: 1-800-661-1532
Emergency No.: 1-416-923-6533

Cyanamid of Canada Inc.
18104 - 102 Avenue
Edmonton, AB. T5S 1S7
Edmonton: (403)448-0115
Calgary: (403)253-0924 Toll Free: 1-800-387-5073

Dexol Industries
Apache Seed Co.
10136 - 149 Street
Edmonton, AB. T5T 1L1
(403)489-4245 or (403)489-0606

DowElanco Canada Inc.
9635 - 45 Avenue
Edmonton, AB. T6E 5Z8
(403)436-6131 Toll Free: 1-800-661-6436

DuPont Canada Inc.
#1000 - 10655 Southport Road S.W.
Calgary, AB. T2W 4Y1
(403)278-8731 Toll Free: 1-800-667-3925

Elston Equipment Co. Inc.
Goodwin Enterprises
R.R. 2
Sundre, AB. T0M 1X0
(403)638-3215

Hoechst Canada Inc.
295 Henderson Drive
Regina, SK. S4N 6C2
(306)721- 4500 Toll Free: 1-800-667-5959

ICI Chipman
Bay 6 - 2135 - 32nd Avenue N.E.
Calgary, AB. T2E 6Z3
(403)250-2872 Toll Free: 1-800-665-9250

Interprovincial Co-operatives Ltd.
945 Marion Street
Winnipeg, MB. R2J 0K7
(204)233-346

Makhteshim-Agan (America) Inc.
c/o Ken Goudy Agri.Chemicals Ltd.
P.O. Box 3008
Melfort, SK. S0E 1A0
(306)752-4584

Monsanto Canada Inc.
#122, 17220 Stony Plain Road
Edmonton, AB. T5S 1K6
(403)483-7971
Calgary: (403)256-3333

Peacock Industries Inc.
P.O. Box 217, R.R. 3
Saskatoon, SK. S7K 3J6
(306)225-4691 or (306)493-2441

Rhône - Poulenc Canada Inc.
5507 First Street S.E.
Calgary, AB. T2H 1H9
(403)253-8471

Rohm and Haas Canada Inc.
Suite 9 - 830 King Edward Street
Winnipeg, MB. R3H 0P5
(204)774-1755

ADDRESS AND TELEPHONE NUMBERS

Chemical Companies

Sandoz Agro Canada Inc.
Suite 302, Plaza 4
2000 Argentia Road
Mississauga, ON. L5N 1W1
(416)821-7850

Sanex Inc.
9577 - 60 Avenue
Edmonton, AB. T6E 0C2
(403)438-1928

Savolite Industries
7610 A - 5 Street S.E.
Calgary, AB. T2H 2L9
(403)258-1777

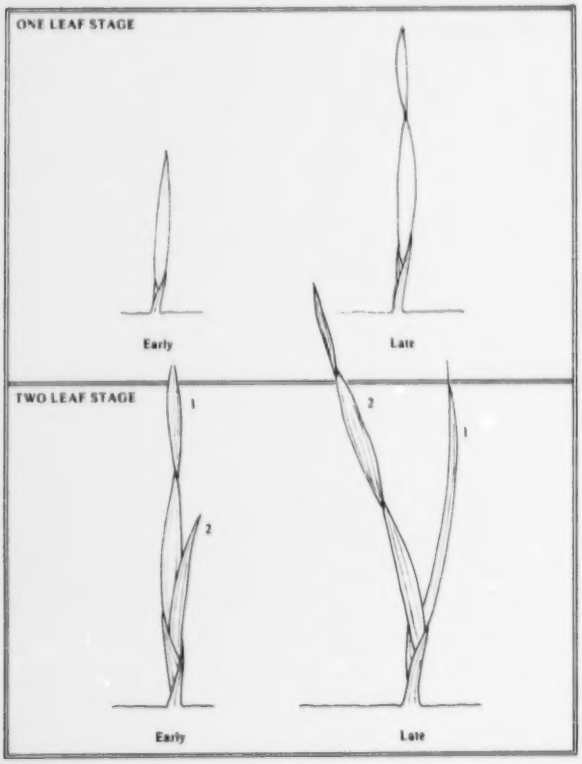
Uniroyal Chemical Ltd.
4 - 2216 - 27 Avenue N.E.
Calgary, AB. T2E 7A7
(403)250-9481
24 Hour Emergency: (519)744-3060

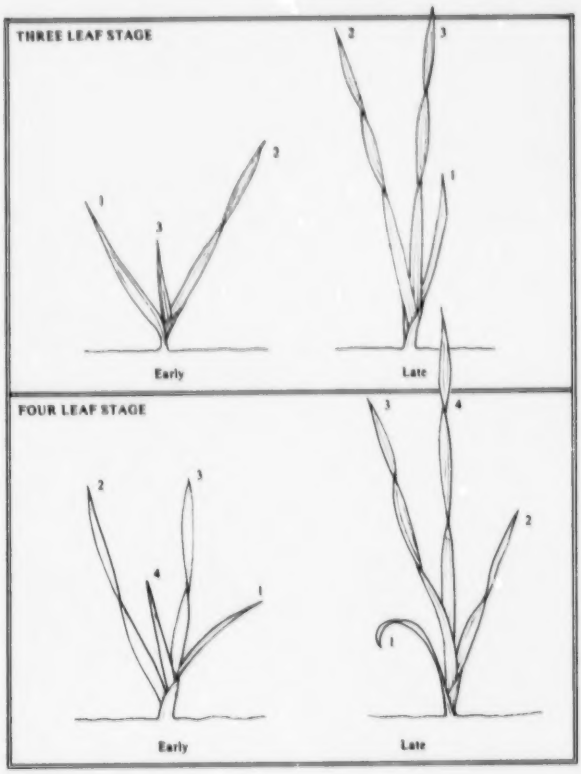
United Agri Products
270 Hodsman Road
Regina, SK. S4N 5X4
(306)721-2201
Fax: (306)721-2524
Toll Free: 1-800-665-2767

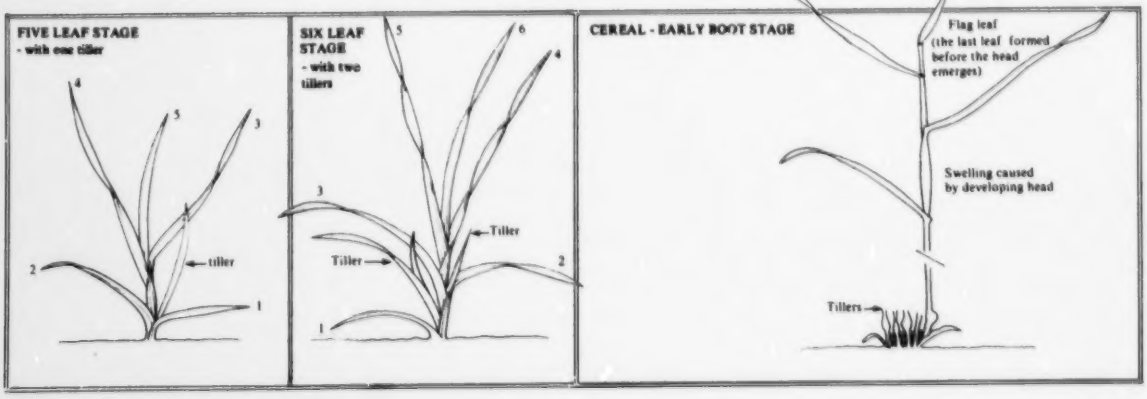
Van Waters and Rogers Ltd.
1305 Clarence Avenue
Winnipeg, MB. R3T 1T4
(204)477-1792
Fax: (204)284-0525

Wilson Laboratories Inc.
36 Head Street
Dundas, ON. L9H 3H3
(416)627-9205

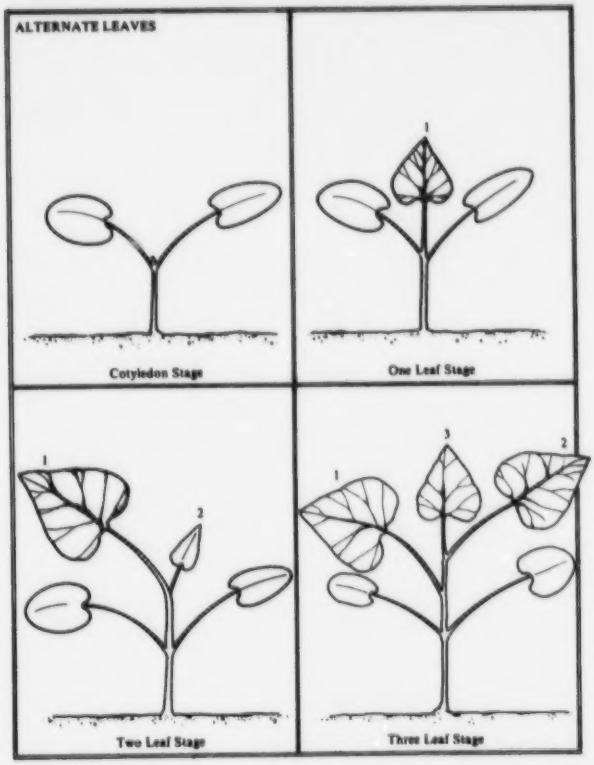
LEAF STAGES — CEREALS and GRASSES

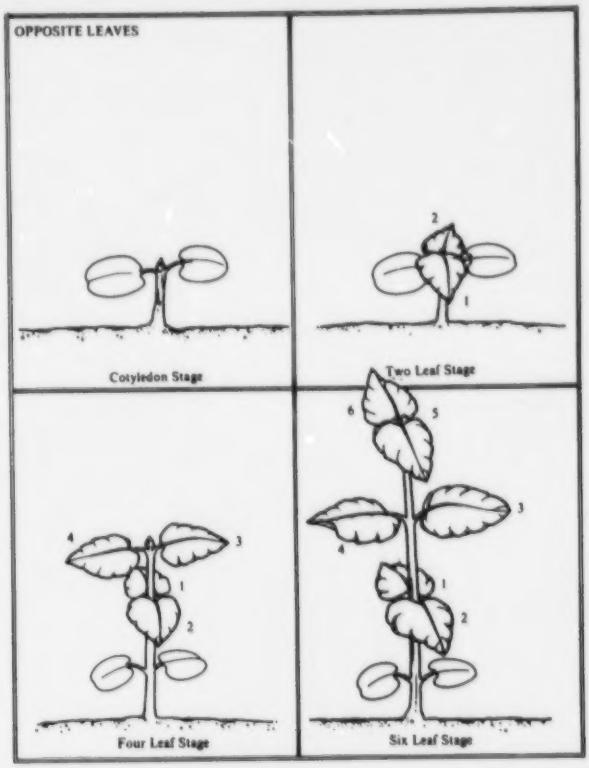


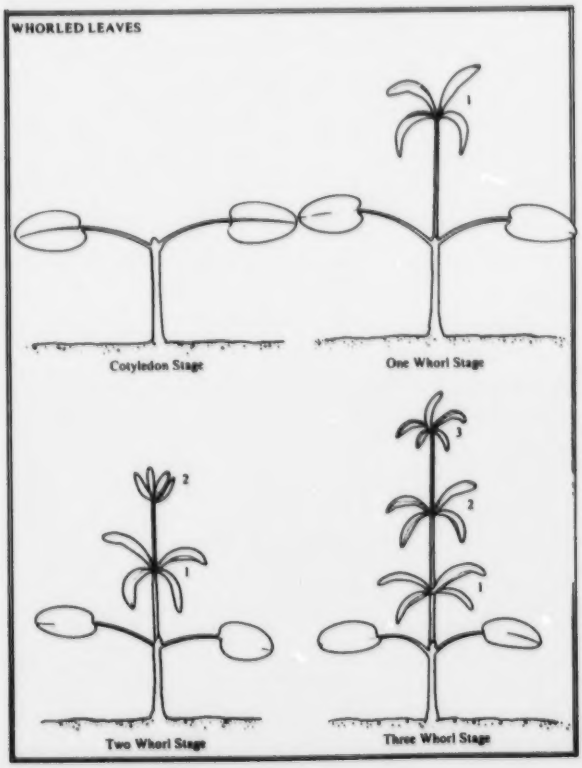




LEAF STAGES — BROADLEAVED WEEDS

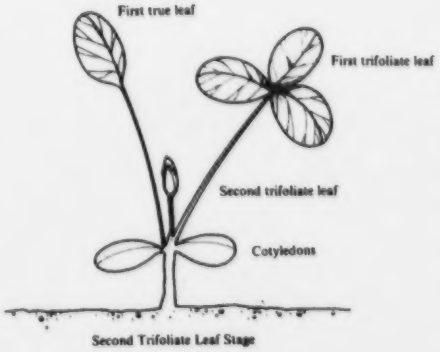




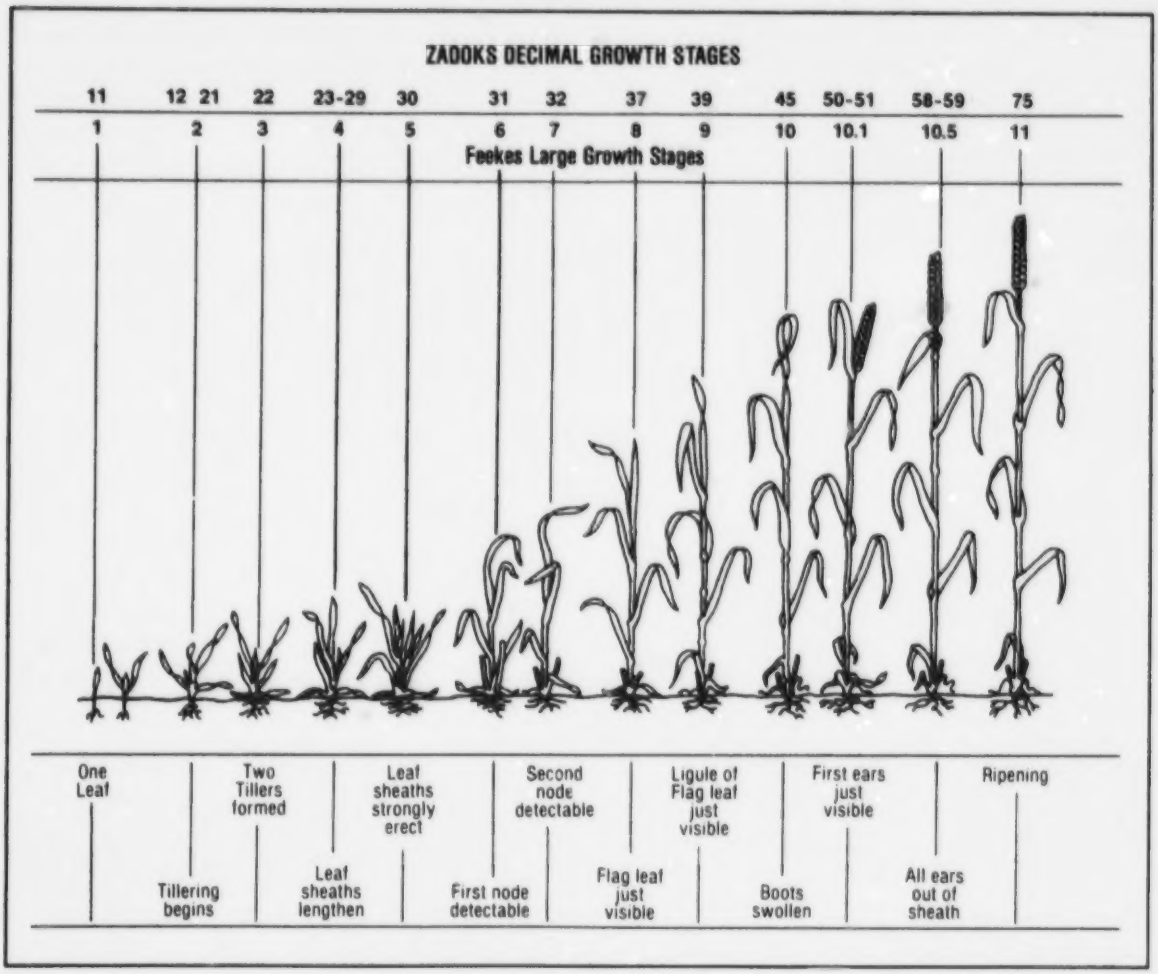


LEAF STAGES — LEGUME CROPS

ALFALFA and CLOVERS



CEREAL GROWTH STAGES


ZADOKS DECIMAL GROWTH STAGES
11 12 21 22 23-29 30 31 32 37 39 45 50-51 58-59 75
1 2 3 4 5 6 7 8 9 10 10.1 10.5 11
Feekes Large Growth Stages
One Leaf
Tillering begins
Two Tillers formed
Leaf sheaths lengthen
Leaf sheaths strongly erect
First node detectable
Second node detectable
Flag leaf just visible
Ligule of Flag leaf just visible
Boots swollen
First ears just visible
All ears out of sheath
Ripening

The Feekes and Zadoks scales define the growth stages of a relatively uniform cereal crop. Completion of these growth stages by the cereal crop will be influenced greatly by soil temperature, moisture, air temperature and day length. For example, stages 2-5 in the Feekes scale may take 5 or 6 weeks, whereas stages 6-10 may be completed in 2-3 weeks under prairie conditions.

To establish the growth stage of a cereal crop using either of these scales, it is necessary to collect a random sample of plants to determine the level of growth attained by the majority of the plants. Under good growing conditions, examination of up to 10 randomly selected plants may be appropriate. Under conditions of uneven germination and low soil moisture conditions, growth stage assessment may require larger samples.

Precise timing of the application of an agrochemical, be it a fungicide, growth regulator, herbicide or supplemental nutrient, is of vital importance in maximizing the desired effect on the target crop. Physiological growth stage, not farming practices based on calendar days, will achieve this desired effect from the agrochemical.

INSTRUCTIONS FOR USE OF GUIDE

INTRODUCTION

This publication is intended to be of assistance in the selection and application of pesticides. The pesticides are grouped into four main sections: herbicides, insecticides, fungicides, and rodenticides. Growth regulators are at the end of the herbicide section and insecticide/fungicide mixes are included in the fungicide section. Each section is indexed separately.

There is a set of charts (at the back of the guide; Herbicides and Insecticides) and a descriptive text which are used as a unit. To select a suitable pesticide follow these steps:

1. Identify the pest(s).
2. Refer to the chart for weed or insect pests and record the pesticide(s) available.
3. Refer to the appropriate pesticide(s) in the text and select the product best suited to your operation.
4. **Apply the pesticide strictly according to instructions given on the label, attached to the product container**.

CHEMICAL PEST CONTROL SUMMARY

1. **Know Your Problems(s).**
   Indentify the pest(s).
   Estimate infestation level or probable economic loss.
   Know the crop variety.*
   If necessary, note soil type or texture of the area to be treated.
   Note: *Some products are restricted to, or excluded from use on specific crop types or varieties.

2. **If chemical control is necessary, choose a pesticide based on the following criteria:**
   Registered products for the given crop. (Tank mixes may have separate recommendations.)
   Pests controlled by the product.
   Crop and pest stage of growth or development.
   Recommended application time (e.g. spring, summer, fall; time of day).
   Cropping and/or harvest restrictions of product(s) considered.
   Use the least toxic suitable product.

3. **Read Product Label Directions for:**
   Recommended rate(s) for the particular pest, infestation level, crop, and field conditions.
   Method of application.
   Any application restrictions during adverse or extreme weather conditions.
   Any other restrictions, cautions, or special instructions.

4. **Clean, Prepare, and Maintain Application Equipment.**
   Lubricate and repair equipment to get best possible performance.
   Clean spray tank of residues to prevent crop damage or problems with equipment.
   Clean, calibrate, and if necessary, replace spray nozzles.
   Check pump and pressure system.

5. **Safely Prepare Pesticides for Application.**
   Use protective clothing and recommended safety equipment, the exposure hazard is greatest during mixing.
   Follow mixing instructions.
   Use the specified amount and quality of water.
   Use recommended rates (tank mix rates may be different from each pesticide used alone).
   If specified, add adjuvants.
   Record rates used, mix order, pesticides and adjuvants used, and water quality for future reference.

6. **Apply Pesticides Using:**
   Recommended safety precautions and equipment.
   Proper application equipment.
   Recommended rates of pesticides, adjuvants, and water.
   Proper time (e.g. growth stage, time of day, season).
   Recommended techniques (e.g. ground speed, pressure, incorporation).
   Record weather conditions at time of application, techniques used, and growth stage of crop and pests for future reference.

PESTICIDE RESISTANCE

THE PROBLEM

Agricultural pests can develop resistance to fungicides, herbicides or insecticides. Resistance is the result of repeated use of one or more similar pesticides over a number of years. In Alberta the potential exists for resistance to develop to a number of products. Producers should follow agronomic practices which prevent or minimize the development of resistance and prevent the spread of existing resistant populations.

Pest biotypes resistant to one or more chemical pesticides occur naturally. Repeated use of one pesticide or of pesticides with a similar **mode of action** can result in a buildup of resistance and a loss of control. Pesticide resistant biotypes do not differ in appearance from the susceptible biotypes. Therefore, it is extremely difficult to observe the progression of resistance until a loss of control is observed.

MANAGEMENT STRATEGIES

Producers should attempt to preventor delay the appearance of resistance through the **rotation of both crops and pesticides.**

Pesticides used in rotation must have different modes of action. Once resistance has been identified, agronomic practices should be designed to eradicate the infestation if possible. It is critical to keep accurate records of pesticide use over a number of years.

IDENTIFYING RESISTANCE

1. Loss of control is observed. One pest may escape control while other pest species are controlled. Herbicide resistant weeds will often initially appear in patches.
2. Was pesticide performance adversely affected by weather conditions or misapplication?
3. Does the field history indicate repeated use of one or more pesticides with a similar mode of action?
4. Did the pest infestation occur after pesticide application?
5. Collect a sample of pest suspected of being resistant. Report any suspected cases of resistance to Alberta Agriculture, Crop Protection Branch.

MANAGEMENT TO PREVENT RESISTANCE

1. Keep accurate records of crop rotation and pesticide use.
2. Rotate both crops and pesticides. When rotating pesticides, use products with different modes of action. Avoid repeated use of one or more similar pesticides.
3. Use clean seed.
4. Use pest resistant crop varieties.
5. Use cultural pest controls, including tillage where practical.
6. Avoid pesticides with long residual activity.
7. Follow label directions regarding management practices.
8. Use good sanitation practices. Avoid spreading crop seed, weed seed, crop residues or manure from suspicious fields.
9. Use mixtures or split applications of pesticides with different modes of action.

Always follow all label directions and restrictions carefully.

SPRAYER OPERATIONS

All types of application equipment are described in the **Guide to Crop Protection in Alberta Part III Pesticide Application Equipment.** A summary of sprayer operations is presented in this publication.

SPRAYER CALIBRATION

Accurate calibration of spraying equipment is an important aspect of chemical usage. An application of more than the recommended rate is wasteful and may damage the crop; applications of less than the recommended rate may be ineffective; again wasteful.

Preliminary Adjustments and Settings

1. Preliminary adjustments and settings include all of the adjustments that are made when the machine is being prepared for use.
2. Before starting to spray, check wheel bearings and tire inflation, and lubricate moving parts as recommended in the operator's manual. Tighten any loose bolts or nuts.
3. Install tips, screens, check valves, and any other equipment that has been selected. Be sure fan nozzles are aligned so patterns overlap slightly but do not interfere with each other.
4. Boom height depends on the spray angle of the tips selected. Set the boom at the required height, and level it from side to side. Improper height causes non-uniform application.

Nozzle Calibration

The output of individual nozzles must be within 5% of the average nozzle output if an even volume is to be applied over the width of the sprayer. Nozzles with outputs either above or below this value must be cleaned and/or replaced.

Brass nozzles should be recalibrated every 25 hours and stainless steel nozzles should be recalibrated every 50 hours. The use of wettable powders will require more frequent recalibration of all nozzles.

1. Check and clean all nozzles, screens, and filters.
2. Check pressure gauge for accuracy.
3. Check boom pressure with an accurate gauge, and compare to sprayer gauge (both should be indentical).
4. With sprayer operating at the desired spraying (boom) pressure, using water only, collect nozzle output for 30 seconds. If ball check valves are used, the pressure should be increased by 35 kPa.
5. Measure and record collected amount from each nozzle on the boom.
6. Calculate average nozzle output.
7. Replace nozzles that have an output 5% greater than average; clean and recheck nozzles with outputs of less than 5% of average (replace if necessary).

Example of Calibration Procedure - Litres per acre (L/ac)

Procedure	Example
1. Determine size of area to be sprayed	30 acres
2. Know sprayer tank capacity	1400 litres
3. Determine spray (water) volume rate/acre (from label*)	40 L/ac (L/ha X 0.4047)
4. Select nozzle (see Nozzle Chart below) for 40 L/ac	8002 = 40 L/ac at 275 kPa and 9 km/h
5. Calculate water volume required	30 acres X 40 L/ac water = 1200 L water
6. Determine pesticide rate/acre (from label)	0.6 L/ac pesticide (L/ha X 0.4047)
7. Calculate amount of pesticide required	0.6 L/ac X 30 acres/tank = 18 L pesticide
8. Set pressure at 275 kPa, drive at 9 km/h. At this speed it takes 36 seconds to travel 90 metres (see Ground Speed Chart below).	

* "Label" refers to the directions on the pesticide container.

Sample Nozzle Chart

Nozzle	Pressure kPa	Litres per Minute	Litres per Acre (50 cm spacing) 6 km/h	8 km/h	9 km/h	10 km/h
8001 or 11001	275	0.38	30	22	20	18
80015 or 110015	275	0.57	45	34	30	27
8002* or 11002	275	0.75	60	45	40	36

Note: *Standard Tips for 40 L/ac at 275 kPa and 9 km/h. For nozzles not included, refer to manufacturer's data or **Guide To Crop Protection In Alberta Part III - Pesticide Application Equipment.**

Ground Speed Determination

Ground speed can be determined by measuring the distance travelled in one minute. Repeat the test several times and average the results. Remember to use the same throttle setting (tachometer) and transmission gear each time. **Run the tests in the field to be sprayed** and have the sprayer tank half-full. Soil surface and load can affect ground speed and a half-full tank represents the average load. The sprayer must be at full speed before starting the test run.

Ground Speed Chart

Speed in km/h	5.0	5.5	6.0	6.5	7.0	8.0	9.0	10.0	11.0	12.0
Seconds to Drive										
60 metres	45	39	37	34	30	27	24	22	19	18
90 metres	68	58	54	51	45	41	36	34	29	27

If spray charts are not available for your nozzles the following formula may be used to establish their spray volume at a set pressure and speed.

$$\frac{24{,}282 \times \text{average nozzle output per minute (L/minute)}}{\text{ground speed (km/h)} \times \text{nozzle spacing (cm)}} = \textbf{Spray volume per acre (L/ac)}$$

Example: 8002 nozzle at 275 kPa has an output of 0.75 L/minute and will apply 40 L/ac at 9 km/h (from chart).

$$\frac{24{,}282 \times 0.75 \text{ L/minute}}{9 \text{ km/h} \times 50 \text{ cm spacing}} = 40 \text{ L/ac}$$

CONVERSION TABLES

Benchmarks

Standard Application **Volume**:	40 litres per acre (L/ac)=100 litres per hectare (L/ha)
Standard Spraying **Pressure**:	275 kilopascals (kPa)=40 pounds per sq. inch (psi)
Standard **Speed** For Spraying:	9 kilometres per hour (km/h)=5.6 miles per hour (mph)
Standard **Nozzle Spacing** On A Spray Boom:	50 centimetres (cm)=20 inches (in)
Standard **Height Above Target** for 80° Nozzle Tips:	45 centimetres (cm)=18 inches (in)
Standard **Nozzle Tips**:	8002 or 11002

Note: A standard nozzle puts out 0.75 litres/minute at 275 kPa. At 9 km/h these nozzles apply 40 L/ac of spray.

Metric Equivalents

1 acre	=	0.405 hectare
2.471 acres	=	1 hectare
6.9 kPa	=	1 psi
1.6 km/h	=	1 mph
2.54 cm	=	1 inch
1 litre/ac	=	2.5 L/ha

SPRAYER CLEANOUT

Reasons for Sprayer Cleanout

1. To prevent crop injury by leftover residues.
2. To avoid loss of activity of the next pesticide by leftover residues.
3. To stop chemicals from corroding or plugging spray equipment.

Clean the sprayer thoroughly when changig chemicals. Clean all parts - sprayer tank, pump, booms , hoses, filters, screens, and nozzles. Plugged nozzle tips should be cleaned with a soft bristled brush or compressed air. **Never use your mouth to blow a tip clean**.

Reduce the amount of waste produced by mixing only the required volume of spray solution and by spraying or reusing as much of the leftover residue as possible. Select a special site for flushing and cleaning of the sprayer. The cleaning site should not be near creeks, dugouts, sloughs, wells or any other water sources. Ensure that wash water does not come into contact with any desirable vegetation or its roots. Make sure discharged wash water (especially from insecticides) will **not** be accessible to children or animals. Do not contaminate any water course or water body with wash water.

Note: Pesticides may have specific recommendations for sprayer cleanout. Refer to product labels, on the container, for recommendations.

Sprayer cleanout following use of Ally, Glean or tank mixes with Glean.
Chlorine Bleach must be used to deactivate these chemicals.

Caution: All traces of liquid fertilizer containing ammonia, ammonium nitrate, or ammonium sulphate must be rinsed from equipment before adding chlorine bleach. Failure to remove ammonia will release a gas which can cause eye, nose, throat, and lung irritation.

1. Wash outside of sprayer and drain sprayer tank completely.
2. Remove and clean filters, screens, and nozzle tips separately.
3. Fill sprayer tank with clean water and with agitator running, flush out through the lines and booms for a minimum of 10 minutes; then drain. If any visible residues of Ally or Glean remain inside the tank, repeat clean water rinse cycle once more.
4. Fill sprayer tank with clean water and for each 100 L of water, add 0.5 L of chlorine bleach (5.25-6.0% sodium hypochlorite). Flush through booms and hoses, then allow to sit for 15 minutes with agitator running; then drain.
5. Repeat chlorine bleach wash cycle once more.
6. Fill sprayer tank with clean water and with agitator running, flush out lines and booms; then drain.
7. Repeat clean water rinse cycle once more.

Sprayer cleanout when changing chemicals (other than Ally, Glean, or Glean mixes) or for storage

1. Wash outside of sprayer and drain sprayer tank completely.
2. Remove and clean filters, screens, and nozzle tips separately.
3. Fill sprayer tank with clean water and with agitator running, flush out through the lines and booms; then drain.
4. Fill sprayer tank with clean water and for each 100 L of water add one of the following:
   1 L household ammonia **or,** 0.5 kg Nutrasol or Solventol **or,** 1 kg trisodium phosphate **or,** 0.6 L Agral 90.
5. Operate the pump and agitator for about 15 minutes, by-passing the solution back into the tank.
6. If possible, let solution remain in tank and hoses overnight; then recirculate and flush out through lines and booms; then drain.
7. Rinse out twice with clean water, recirculating and draining each time.

At end of spraying season

1. Add light oil or antifreeze during the final stage of last rinsing to leave a protective coating on all internal parts.
2. Remove pump and store indoors.
3. Close all openings into the sprayer to prevent entry of debris or rodents.

PREPARATION AND APPLICATION OF PESTICIDES

PROPER MIXING OF PESTICIDES

1. Fill the sprayer with half the required amount of clean water.
2. Shake the closed pesticide container vigorously.
3. Slowly add pesticide to sprayer with agitator operating.
4. Allow container to drain into sprayer for 30 seconds.
5. Fill container 1/4 full of rinse water, replace top, shake vigorously, drain into sprayer for 30 seconds.
6. Repeat Step 5 three times.
7. Fill sprayer tank with water, spray at once.
8. Always agitate vigorously if sprayer has been standing for a time after mixing.

ADJUVANTS (SURFACTANTS, WETTING AGENTS, SPREADERS, ETC.)

Adjuvants are added to a pesticide to enhance application and/or performance. The most common group of adjuvants used in pesticides is **Surfactants**. If adjuvants are required, **use only those products named and recommended on the label.** Failure to do so could result in:

1. crop injury,
2. reduced pest control,
3. invalidation of pesticide warranty.

Surfactants facilitate and enhance the emulsifying, dispersing, wetting, spreading, sticking, penetrating or other surface-modifying properties of liquids to bring about enhanced pesticidial action. Since these chemicals produce physical changes at the surface of liquids, surfactants are often referred to as **surface-active** agents.

Surfactants can be generally classified into two major groups based on their ionization in water: ionic or non-ionic. **Ionic surfactants** ionize when mixed in water, that is, divide into two charged entities - a positively charged ion (cation) and negatively charged ion (anion). An example is ammonium sulphate ($2\ NH_4^+ + SO_4^-$).

Non-ionic surfactants do not ionize in water. Consequently, they are unaffected by hard water, can be used in strong acid solutions, and are more soluble in cold water than in hot water. Some of the commonly recommended non-ionic surfactants for herbicide mixtures are: Agral 90, Ag-Surf, Citowett Plus, Super Spreader-Sticker, Triton XR, Tween 20.

TANK MIXTURES

Tank mixtures are two or more separate pesticides mixed in the sprayer tank, as opposed to a mixture formulated by the manufacturer. For example, wild oat herbicides are frequently mixed with a broadleaf herbicide to control a wide range of weeds.

Rate to Use in Preparing a Tank Mix

Always check the product labels for the recommended tank mix rates. Generally add the amount you would use if each pesticide was applied separately but **there are exceptions**. Generalizations may be dangerous to your pocket book and also your crop.

Preparing a Tank Mix

To avoid physical incompatibilities go through the following steps:

1. add half the required amount of water and mix with one pesticide,
2. agitate,
3. with agitator running, add the other pesticide. Add pesticides to the spray tank in the following order to reduce the possibility of formation of precipitates or gums which may clog nozzles and filters:
    1. Soluble Powders
    2. Wettable Powders and Flowable Liquids
    3. Solutions (amines and salts)
    4. Additives (surfactants)
    5. Emulsifiable Concentrates (esters)

For specific mixing instructions always check the product labels as there may be exceptions to these guidelines.

Avoid Tank Mix Problems

Check the labels for recommended crops, pests, and rates for tank mixes as they may be restricted compared to the recommendations for each individual product. For example, either Poast or MCPA amine **alone** can be used on several crops. A Poast+MCPA amine **tank mix** can only be used on flax.

Crop injury, reduced pest control, or physical incompatabilities may be the result of using tank mixes improperly. When herbicides for grassy weed control are mixed with herbicides for broadleaf weed control, a partial loss (sometimes total loss) of activity on grassy weed control is quite common. When reduced weed control or crop injury is likely to occur the advantages of tank mixing are soon lost.

Guidelines to Avoid Tank Mix Problems are:

1. Tank mix properties are not necessarily the same as those of the individual pesticides applied separately.
2. Use registered tank mixes only.
3. Check the labels for recommended crops, pests, rates, and adjuvants for tank mixing.
4. Follow label directions for preparing the mix.
5. Use only on crops or varieties registered for the particular tank mix.
6. Apply at the recommended stage of growth or development of crop and pest(s).

PLANT GROWTH REGULATORS (PGR'S)

Plant Growth Regulators (PGR's) are chemicals which affect the normal growth process of plants. They are generally used on crop plants for increased yield, promotion of flowering, reduction in lodging, etc. For example, Cerone is a PGR registered for use on barley (excluding Birka) and spring wheat.

AIRCRAFT APPLICATION

Aircraft applicators must take care to get even distribution of pesticides, and avoid damage to crops. The following suggestions are offered to help minimize these hazards.

1. **To get best coverage of crops and minimize the loss of spray to the atmosphere** - Spray in winds under 15 km/h. For best results apply herbicides in volumes not less than 14 L/ac. Fly as low as is safe. Width of swath should not be more than 1.25 of wingspan. Space the nozzles on the boom to give uniform distribution in the swath in spite of swirl from propeller and vortexes at the wing tips.

2. **To avoid drift damage from aircraft application** - Do not spray when wind is blowing toward a sensitive crop, shelterbelt or garden. Safe distances cannot be given. Do not spray in dead calm near sensitive plants. Do not apply volatile herbicides near a sensitive crop, shelterbelt or garden since the vapors rising from the field after application may be blown onto these plants.

3. **To Avoid Injury to Crops** - Use water as a carrier in preference to oil as injury is less likely. Apply at "safe" growth stage of the crop. Select the best chemical for the crop and weeds that are present and use only enough material for the degree of control desired.

PESTICIDE CONTAINER DISPOSAL

In Alberta, the following procedure should be used when disposing of pesticide containers even though the label suggests alternate forms of disposal.

1. Triple rinse container with water and put the rinse water into sprayer tank.

2. Crush or puncture container, never reuse the container for other purposes.

3. Deliver containers to an approved pesticide container collection site (contact local agricultural fieldmen for the site closest to you).

WHAT TO DO IF RESULTS ARE UNSATISFACTORY

1. Was the choice of pesticide(s) suitable? Are the crops and pests treated, listed on the product label(s)?

2. Compare your method of pesticide preparation to the product label(s) instructions.

3. Check for equipment malfunction - e.g. plugged screens, nozzles worn or mixed type or size.

4. Compare your application techniques with those given on label(s) - e.g. stage of growth or development of crop and pest(s), ground speed, pressure, incorporation.

5. Consider weather conditions at application time - several labels include cautions against application during weather extremes e.g. cold, heat, drought.

6. Consider time since application. Some results are not apparent for several days. Look for early symptoms of the chemical taking effect.

7. If there are no results after the specified time in **Expected Results** seek technical help. Gather all relevant data, particularly evidence such as photos or specimens. Record wind, rainfall, soil moisture condition, crop variety, fertility, quantity of material used, acres treated, and temperature at time of spraying.

8. Document everything in writing. If crop damage is involved submit a specimen for diagnosis. Disease or insect damage can resemble herbicide injury.

PESTICIDE USER RESPONSIBILITY

Pesticide Drift

A concern for ground as well as aerial application. Landowners are responsible for ensuring that any pesticide applications conducted on their property are conducted in a safe, responsible manner.

1. The choice of chemical should be made with adjacent land uses in mind. If neighbours have livestock, bees, shelterbelts, and gardens that may be affected by off-target drift, they should be consulted prior to application. Perhaps a different chemical, formulation, or application method will provide the same control and greater compatibility with neighbouring land uses.

2. All sprayers (ground or air) should be calibrated prior to use, taking into consideration nozzle type, nozzle pressure and boom height. Calibration will assure better performance as well as reducing the risk of chemical drift. If you are hiring a custom applicator, be sure to ask when the equipment was last calibrated and be sure to check during the application to see whether any visible drift is occuring.

3. Buffer strips should be left when applying pesticides next to sensitive crops and farmsteads. The size of these strips will depend on the chemical used, application method, and degree of risk from escaping drift. Where applications are being conducted near rivers, creeks, lakes, irrigation canals, or other open water bodies a buffer strip of **thirty metres** is required by law. This requirement will minimize the risk of chemical residues in water supplies and adverse impacts on aquatic environment. A permit must be obtained from Alberta Environment to perform pesticide applications within this thirty metre area to ensure that water users will not be affected by the proposed pesticide application and that the application is conducted in a manner that will not adversely impact aquatic or riparian habitats.

4. Pesticides should not be sprayed when winds are excessive (generally winds over 16 km/hr are considered a drift hazard). Pesticides should only be sprayed when winds are blowing away from farmsteads, sensitive crops, or water bodies. Conditions of "dead-calm" or temperature inversions should also be avoided to prevent vapour clouds.

5. Always assess the risk to adjacent landowners and never push weather conditions to meet deadlines. If completing an application as planned may mean damaging your neighbour's property, postpone the application or modify it to prevent off-target damage.

Landowners can be held liable for pesticide drift even if a custom applicator was hired to perform the application. When you hire a custom applicator, it is important that you hire someone who has the knowledge, the equipment, the experience, and the desire to perform an application properly. Custom applicators must be aware of neighbouring residences and sensitive crops, (including gardens, livestock, bees, shelterbelts, and gardens) which could present problems if drift should occur.

Notification

When pesticides are applied on private property, it is the landowner's responsibility to notify neighbours. Neighbouring landowners should be given enough advance warning to move children and pets indoors, to remove laundry from clotheslines, and to close windows and doors if any of these precautions are necessary. Advance warning (preferably 24 hours) is desirable. Where application timing cannot be guaranteed (e.g. many aerial applications), landowners should advise neighbours of approximate spraying time with some type of "signal" prior to application commencement. Notification is a simple courtesy that will keep neighbourhood relations friendly and provide a safeguard in case of accidental drift.

Pesticide Disposal

Unwanted or out-of-date pesticides should be disposed of very safely and responsibly. Pesticides are hazardous wastes and cannot be disposed of in sanitary landfills or by burning. If you will not be able to use pesticide supplies, check to see whether a neighbour may have some use for them. Pesticides that have no further use must be disposed of through a qualified (licenced) hazardous waste disposal firm. Information regarding disposal arrangements and costs can be obtained from the Alberta Special Waste Management Corporation (1-800-642-3830).

Water Protection

1. The preservation of water quality is critical to our sustained quality of life and agricultural production:

2. Pesticides must not be stored, mixed, or applied within 30 metres of an open body of water unless special permission has been obtained from Alberta Environment.

3. Pesticide application equipment must not be washed within 30 metres of an open body of water.

4. Pesticides that are subject to leaching should not be used on soils with a high leaching potential to prevent groundwater contamination. Pesticide leaching characteristics and soil leaching potentials are available from Agriculture Canada.

5. Never store pesticides in well houses.

6. Haul water to your sprayer and fill it in the field rather than taking the sprayer near the water source.

7. Do not leave sprayers unattended while filling.

Pesticide Spill Cleanup
In the event of a pesticide spill, ventilate area, wear protective clothing. Prevent pesticide entry into sewers or water supply. Absorb spill on paper or sand. Wash site with detergent. If the spill is large, evacuate area and notify safety personnel. Dispose of all absorbant materials in an approved landfill. Contact Alberta Environment for more information: 427-5855 or 1-800-222-6514.

PESTICIDE APPLICATOR LICENCING

Anyone applying pesticides (herbicides, insecticides, fungicides, or rodenticides) in exchange for a fee must be licenced by Alberta Environment. If someone is offering to spray your property, ask to see a pesticide applicator licence (all applicators are issued wallet-sized identification cards). If you wish to check the status of a licenced applicator, or lodge a complaint regarding the unsafe or illegal application of a pesticide, please contact any office of the Pesticide Management Branch of Alberta Environment:

Edmonton 427-5855 Calgary 297-8279 Lethbridge 381-5511 Grande Prairie 538-5460

Alberta Environment also provides a 24 hour toll free number: 1-800-222-6514

A list of aerial application services throughout the province is available through your local District Agriculturalist. A list of custom applicators (ground and air) is available through Alberta Agriculture in a publication entitled "Directory of Custom Operators in Alberta" AGDEX 825-17. Please remember that a licence is not a guarantee of performance. A licence only certifies that the licence holder has met a minimum standard of knowledge - it cannot assess an applicator's integrity or the honesty of his business practices. If you are uncertain about the reliability of a particular applicator, ask for references.

SAFETY PRECAUTIONS

WARNING SYMBOLS

Visual warning symbols on pesticide labels provide an indication about the kind of harm that can result from pesticide misuse or mishandling. They alert the user to both the degree, by the shape of the border, and the type of hazard, by the centre "picture".

The "fire" symbol is a warning that the pesticide is flammable or easily ignited. Keep the pesticide away from heat, sparks, or open flames. Do not smoke while mixing or applying the product.

The "exploding grenade" symbol indicates that the pesticide can explode, e.g. pesticide in pressurized cans. Explosive conditions may also be created by using Roundup or Rustler (glyphosate) in a galvanized steel spray tank.

The "corroded hand" symbol indicates that the pesticide is corrosive to the skin and eyes. The chemical is either acid or alkali (caustic) and can burn the skin. Protect the skin and eyes when using these products.

The "skull and cross bones" symbol warns that the chemical is poisonous if taken into the body. Keep the product out of reach of children. Use the appropriate safety measures when dealing with poisonous products.

PESTICIDE TOXICITY

Toxicity is defined as the state, quality, or degree of being poisonous and is dose related. Toxicity is usually expressed as an LD_{50} value. LD_{50} value (expressed as mg/kg) is an abbreviation for the dose that is lethal to 50% of the population of test animals. The smaller the LD_{50} of a pesticide, the more toxic the pesticide. LD_{50} is usually expressed on the active ingredient (technical) of the product. In this publication, the LD_{50} of the formulated product, if available, is also given.

The following table relates the oral LD_{50} (mg/kg) of a pesticide to its toxicity.

LD_{50} less than 500 mg/kg indicates high toxicity	LD_{50} 500-1000 mg/kg indicates moderate toxicity	LD_{50} 1000-2500 mg/kg indicates low toxicity	LD_{50} greater than 2500 mg/kg indicates very low toxicity
DANGER POISON	WARNING POISON	CAUTION POISON	

The relative hazard of a pesticide is dependent upon the toxicity of the pesticide, the dose, and length of time of exposure. For example, a pesticide which is low in toxicity can cause chronic health problems due to long term exposure. **Therefore, it is imperative to reduce exposure when using all pesticides whether they are highly toxic or have very low toxicities.**

SYMPTOMS OF POISONING

Pesticide poisoning can be acute (due to an accident) or it can be chronic (due to continued exposure over a long period of time). Accidental contact with a pesticide will not necessarily lead to poisoning. Both types of poisoning can exhibit mild, moderate, or severe symptoms as follows:

Mild poisoning symptoms: Mild symptoms may be vague and can be compared with sickness such as influenza. Typical symptoms include nausea, headache, tightness of chest, loss of appetite, stomach cramps. These can be immediate or be delayed by 12-24 hours.

Moderate poisoning symptoms: These symptoms are usually more pronounced than mild symptoms. They include nausea, trembling, muscular incoordination, excessive saliva, blurring of vision, tightness of chest, difficulty in breathing, flushed or yellow skin, abdominal cramps, vomiting, diarrhea, tearing from eyes, profound weakness, rapid pulse, cough.

Severe poisoning symptoms: Severe symptoms are often more specific and require immediate hospital treatment. They include vomiting, diarrhea, excessive sweating, inability to breathe, convulsions, fever, intense thirst, coma.

Toxicity, Hazard, and Risk
There is a distinction between the terms "toxicity", "hazard", and "risk". Users of pesticide should clearly understand the principles behind these terms.

Toxicity: The quality or potential of a substance to cause injury or illness. It is the inherent chemical and physical properties of the substance that can cause a predicted biological impact. For example, a pesticide of LD_{50} value = 10 mg/kg will kill 50% of the organisms if 10 mg per kilogram of body weight is administered.

Hazard = Toxicity X Exposure: Hazard is a function of the toxicity of the pesticide, the dose, and the length of time the exposure occurs. For example, no hazard exists when the container of a pesticide is sealed, once the seal is broken exposure can occur and a hazardous condition is created.

Risk = Hazard X Potential: Risk is a function of how the individual handles the pesticide product. The hazard is the same when a pesticide is being poured into the spray tank. The risk is different if one person wears a hard hat, coveralls, rubber boots and nitrile gloves and the other person wears none of these. Therefore, the user can **control the risk** by carefully **managing** the hazard.

It is imperative for users of pesticides to minimize their exposure. It is each individual's responsibility to limit this exposure through personal protection and careful handling of pesticides.

REDUCING EXPOSURE TO PESTICIDES

Routes of Exposure
Pesticides may enter the body through the skin (dermally), the mouth (orally), and by inhalation. Of the three routes of entry, penetration through the skin is the most common.

Dermal Exposure: Minimizing the risk of dermal exposure is possible through the careful selection, use and care of protective clothing and equipment. Protective clothing can provide a barrier which reduces pesticide contact with the skin. See **Protective Clothing and Equipment** for recommended wear. To help reduce pesticide buildup, clothing should be laundered daily, using recommended procedures; see **Cleaning Clothing and Equipment**.

Pesticide-contaminated clothing should also be laundered separately from the rest of the family wash as pesticides can be transferred to other clothing during the laundry process. Since it is not always possible to remove all pesticides by laundering, clothing worn during pesticide use should be restricted to that use only, thereby eliminating the possibility of continued dermal exposure due to pesticide residues remaining in the clothing.

The greatest risk occurs when the chemical concentrate is handled, therefore extra caution should be exercised at that time. The use of an impermeable apron is highly recommended when handling all pesticide concentrates, regardless of toxicity. Clothing contaminated by accidental spills of concentrated pesticide should be discarded rather than laundered, as even ten launderings were unsuccessful in removing concentrated methyl parathion.

Although not all pesticides are absorbed by the skin, they may still cause skin problems such as redness, blisters, or dry scaliness that may lead to serious skin eczema and dermatitis. Good personal hygiene is important to help minimize pesticide absorption through the skin. Shower, shampoo the hair, and put on clean clothing immediately after you finish using pesticides for the day or after an accidental spill.

Eyes are very sensitive to pesticides. They can be exposed to vapour or fumes, spray drift, or accidental spills and splashes when containers of liquid concentrates are being opened or when the concentrated chemical is being poured into the sprayer tank. Safety goggles should be used when handling the concentrated chemical, regardless of the toxicity level. Do not wear contact lenses. Cuts and scrapes should be cleaned and bandages changed after handling pesticide to avoid possible dermal absorption from contaminated bandages.
Protect ears when sprays or spills are likely to contaminate the head. Use disposable ear plugs that fit into the ear canal. Use earplugs once and dispose of them after use.

Oral Exposure: Pesticides can enter through the mouth when users eat or smoke with contaminated hands, or lick their lips. Face and hands should be washed thoroughly prior to eating or smoking. Children may be poisoned if they drink pesticides which have been stored in pop bottles. All pesticides must be stored in their original containers and should be placed in a locked area out of reach of children.

Inhalation Exposure: Pesticides can enter the body rapidly through the inhalation of fumes, dusts, or spray mists. Fumes and extremely fine particles of dust or spray can be completely absorbed by the lungs resulting in a high risk situation. To minimize exposure, respirators should be worn when moderate or highly toxic chemicals are opened and being mixed. **Read** the pesticide label and **follow precautions** outlined.

Protective Clothing and Equipment

The use of an impermeable apron is highly recommended when handling all pesticide concentrate regardless of toxicity.

Standard Protective Clothing
The minimal level of protective clothing which **should always be worn** when working with pesticides:
- long sleeve shirt: worn closed at neck and cuffs
- long pants
- coveralls: worn closed at neck
- neoprene overboots or long rubber boots: pant legs worn over boots (not inside)
- unlined neoprene or nitrile gloves: sleeves worn over gloves (not inside)
- wide-brimmed hard hat (without leather liner)

Handling Low Toxicity Pesticide Concentrate
Add the following to the Standard Protective Clothing that is worn:
- impermeable apron
- goggles or face shield

The apron and goggles/face shield may be removed after mixing operations (low toxicity pesticide) unless goggles/face shield are specified on the pesticide label.

Handling Moderate or High Toxicity Pesticide Concentrate
Add the following to the Standard Protective Clothing that is worn:
- impermeable apron
- goggles or face shield
- respirator

The apron may be removed after mixing operations. Check pesticide label (especially with high toxicity pesticides) if goggles/face shield and/or a respirator should also be worn while applying the pesticide.
Always check the label on pesticide container for any extra precautions required.

Avoid Wearing

These materials absorb chemicals and prolong exposure to the wearer; most are not easily cleaned:
- cloth or leather gloves
- canvas or leather shoes or boots
- leather watch strap or belt
- fabric baseball caps
- contact lenses

Coveralls: In addition to cotton or cotton/polyester coveralls which should be laundered after daily use, there are a number of disposable coveralls now on the market. The advantage of disposable coveralls is that they add **an extra layer of protection** and are discarded after use, rather than being laundered and reused, thus avoiding the problem of whether or not the pesticide is removed in laundering. Not all disposable coveralls, however, are suitable for use with pesticides, especially liquid pesticides. If you use disposable garments, read the label carefully and ask questions. **Make sure they are the extra-protection type and are recommended by the manufacturer for pesticide use, otherwise do not buy them.**

Disposable coveralls recommended by manufacturers for pesticide use, generally fall into two price ranges:
- the less expensive cost around $10 (roughly between $7 and $13), and
- the more expensive cost two to three or more times as much. The two types differ in their degree of repellency or impermeability, as well as their durability and comfort. Each has advantages and limitations and selection should be made with care, to suit a particular end use.

An example of the lower priced disposable coverall which is recommended by the manufacturer is Kimberly-Clark's KleenGuard Extra Protection coverall (white coverall sewn with red stitching thread). This coverall has been given a finish to provide extra repellency to liquid pesticides.
Warning: The grey KleenGuard coverall with blue stitching and the white KleenGuard with the green stitching have not been given the finish to provide extra repellency and should not be purchased for pesticide use. One advantage of the KleenGuard Extra Protection garment is that it is breathable; this means that it allows perspiration from the body to evaporate and pass through it into the atmosphere. While KleenGuard has the ability to breathe, it prevents light sprays (which are not under pressure) from penetrating through the coverall to the clothing beneath. **Major spills/splashes, and especially those under pressure, will pass through the coverall to the clothing beneath.** In the event that a major splash occurs, the coverall and all clothing worn under it should be immediately changed. Coveralls should also be replaced if they rip, tear, develop holes or thin spots, or if fibers are raised to the surface forming pills. Remember, these garments are worn to give an added layer of protection; their durability is limited as is the amount of pesticide they are able to repel.

Polyethylene coated Tyvek and saran coated Tyvek (Saranex) are two types of the more expensive coveralls and are recommended for use with liquid pesticides. Regular Tyvek, which is in the lower price range, is recommended for use with granular, dust, and powdered forms of pesticides. The coated Tyvek coveralls have better durability and are better able to repel liquid pesticides, especially larger spills or when pesticide is under pressure. Comfort, however, has been found to be a problem. If they are to be worn for long periods of time in hot weather, their good impermeability results in poor breathability; hence they are less comfortable to wear.

Whichever type of disposable coverall is being used, care should be taken not to contaminate the interior of the coverall when it is being removed, if it is to be worn for more than one wearing. Between wearings, hang in a well-ventilated area away from other clothing. When it is time to discard a disposable coverall, place in a plastic garbage bag and take to a landfill site for disposal; do not burn.

Impermeable rainwear coveralls and 2-piece suits can be purchased at comparable prices to the more expensive disposable coveralls. They are readily available and are generally a P.V.C. (polyvinyl chloride) coating on nylon. While they are excellent in liquid repellency, even under pressure, they too suffer from lack of comfort because they are impermeable. They may be hosed down and washed after use.

Boots: Neoprene overboots or long rubber boots are the recommended footwear as they are less likely to absorb pesticides and are more easily cleaned. Be sure to wear the pant leg over the boot to avoid pesticide running down into the boot. In case of such an accident, wash out immediately, otherwise wash the outside of the boots daily.

Wide Brimmed Hard Hat: Prevent powders, dusts, or spray mists from being deposited on the hair or scalp by wearing a hard hat. The hard hat should be washed daily. Avoid the use of hard hats with leather inner bands. When wearing a hooded disposable coverall, the hood may be used instead of a hard hat.

Gloves: Unlined gloves are required when handling, mixing, or pouring concentrated pesticides and are advised to be worn when applying field strength pesticides; adjustment of equipment should never be made with bare hands. A variety of glove materials may be found on the market. Nitrile and Neoprene gloves are suitable for pesticides. Butyl rubber gloves are 100% gas impermeable and offer superior resistance to most toxic chemicals. All gloves should be washed soon after the concentrated chemical has been mixed as pesticide may penetrate into the material if it is not cleaned off. Studies reveal that the greatest exposure is often via the hands. Care should be exercised to avoid contaminating the interior of gloves when they are taken off and put on. If possible, wash the outside of the gloved hand prior to glove removal. At the end of the day both the inside and outside of the glove should be washed. Prior to use, inspect gloves and replace them immediately if cracks, swelling, discoloration, holes, or rips develop. Cuff gloves, and wear sleeves over top of gloves to help prevent spills and splashes of pesticide from running down inside gloves. Do not continue to wear contaminated gloves and **avoid wearing leather, cloth or natural rubber gloves** as they soak up the chemical and become a source of continuous contamination.

Goggles or Face Shields: For eye protection, wear goggles or face shields which are resistant to chemicals and have ventilation to prevent fogging. Always wear eye protection when handling the concentrated pesticide. If the pesticide label recommends it, continue to wear eye protection when applying the pesticide. Do not wear contact lenses when handling pesticides.

Respirators: Permanent respirators have one or two cartridges screwed onto a facepiece. Each cartridge contains a prefilter which removes dust particles and a filter of activated charcoal which absorbs the chemical. The cartridges are unscrewed and discarded as soon as any odour of the pesticide is detected in the facepiece. Permanent respirators are cleaned after each day's use: unscrew the cartridges and wash the facepiece with soap and water. Rinse the facepiece in clean water, dry with a clean cloth, and screw on the cartridges. The clean respirator should be stored in a sealed plastic bag to prevent cartridges from absorbing air borne contaminants. **Disposable respirators** have the prefilter and filter in one cartridge that is permanently attached to the facepiece. The entire respirator is discarded when any odour is detected in the facepiece. These respirators should also be stored in a sealed plastic bag.
Special Note: Applicators should buy respirators and cartridges approved for use with pesticides. Gauze and dust masks are not respirators and are not recommended for pesticide dusts.

Gas Mask: These are used when an applicator is likely to be exposed to **very high levels** of pesticides. The facepiece covers the eyes, nose and mouth. It is connected by a flexible hose to a charcoal canister worn on the belt. The lifespan of this canister is longer than that of the respirator cartridges. Manufacturer's directions are to be followed for cleaning and storing gas masks and canisters.

Tractor Cab Filters: Charcoal filters are available for fitting onto the tractor air intake system, to filter out pesticides from the air entering the tractor cab. The use of these filters is highly recommended to reduce pesticide exposure during spraying operations.

Safety Equipment Stores: Safety clothing and equipment are sold by U.F.A. Co-op, Fleck Bros., Levitt-Safety Ltd., and Safety Supply. Disposable coveralls: Kimberly-Clark KleenGuard Extra Protection are available at Acklands; polyethylene and saran coated Tyvek may be ordered from Safety Supply.

CLEANING CLOTHING AND EQUIPMENT:

Skin can absorb chemicals from inadequately cleaned clothing and equipment. Safe removal of pesticide demands special care in handling and washing contaminated clothes.

Handling Pesticide-Soiled Clothing:
- handle soiled clothing with unlined, nitrile gloves
- remove pesticide granules from cuffs and pockets outdoors
- discard any garment saturated with full-strength chemical concentrate
- temporarily store clothing in disposable plastic bags before washing
- take disposable clothing to approved landfill

Washing Pesticide-Soiled Clothing:
- wash daily
- wash separately from regular laundry
- pre-treat with a stain removal product if an emulsifiable formulation is used or
- pre-rinse on pre-soak cycle of washer
- avoid overcrowding washer
- use hot water setting
- use full water level and normal cycle
- use extra heavy duty detergent as recommended for heavily soiled loads
- repeat wash procedure
- clean washer after use (run empty washer through full cycle with hot water and detergent)

Drying:
- line dry to prevent contamination of dryer and increase the chemical breakdown of pesticide residues

Washing Other Equipment:
- wash equipment daily in hot soapy water. This includes hard hat, goggles, apron, gloves, boots and respirator (avoid getting charcoal wet, remove it if possible).

Remember: Try to limit clothing worn while handling pesticides for that use only. Some pesticides are difficult to remove from clothing. For continuing safety, remember to wear recommended protective clothing; wear suitable safety equipment, and wash protective clothing and equipment, except disposable coveralls, after daily use. Disposable coveralls provide an extra layer of protection. **For further information on protective clothing for pesticide use:** Contact your local District Home Economist or Home Economics Branch, Edmonton.

OTHER PRECAUTIONS AND SAFETY TIPS

Remote Control Devices: (e.g. solenoid valves) can be installed to remotely control the sprayer, preferably from within the tractor cab. This can reduce operator exposure to pesticides.

Tractor Cab Cleanup: After spraying pesticides, the inside of the tractor (seat, steering wheel, etc.) can be decontaminated by wiping with warm soapy water and a sponge.

Honey Bee Safety: Bees may be affected by pesticides. Avoid spraying near hives or contaminating puddles of water from which bees may drink. Spray early in morning or late in afternoon when bee activity is at minimum. Warn beekeepers of your intentions so they can confine the bees or move them until spraying is over.

Farm Safety Program: For further information on pesticide safety please contact the Farm Safety Program Branch of Alberta Agriculture at 427-2186 or write to the Edmonton office at Room 200, 7000 - 113 Street, Edmonton, Alberta, T6H 5T6.

FIRST AID

POISON INFORMATION CENTRES **(Alberta) 1-800-332-1414** **(Calgary only) 270-1414**

The emergency department of most hospitals can deal with pesticide poisoning. However, the Poison Centre in Calgary can provide information on recognizing poisoning symptoms and in giving the right treatment.

Some manufacturers have emergency telephone numbers to call in case of pesticide poisoning.

Chipman	Cyanamid	Monsanto	Uniroyal Chemicals	Rhône - Poulenc
1-416-528-6771 1-416-643-4123	1-416-356-8310	1-314-694-1000	1-519-744-3060	1-416-634-2359

STANDARD FIRST AID MEASURES

Before using a pesticide, look for the warning symbol on the label. This indicates the toxicity of the pesticide. If you are severely exposed to a pesticide and you are alone, **do not panic**. The symptoms of the pesticide do not show up immediately. You will have some time to decontaminate yourself.

If on skin: Get any spilled pesticide off your body immediately. If the pesticide is on your clothes, remove them and rinse your skin with water. After rinsing, wash the area with soap and water. Obtain medical attention if area of contact is large or if irritation persists.

If in eyes: Wash eyes with water at once. Hold the eyelids open and wash eyes for at least 15 minutes with fresh water each time. Get help to take you to the emergency department of the nearest hospital and take the labelled container with you. Do not use any eye medication unless prescribed by a doctor.

If swallowed: Seek medical attention. Do not induce vomiting even though label instructions may say so. Health and Welfare Canada states that inducing vomiting by a non-trained person can be more hazardous to the victim than the chemical itself. Get to the nearest hospital as soon as possible.

MINOR USE REGISTRATIONS

Minor use registrations are approved uses, but may or may not appear on the current product labels. Check product write-up for details.

Chemical	Minor Use	Reference
Cygon, Lagon, Dimethoate 480	Grasshopper control in safflowers Aphid control on canary seed.	Page 121
Dual	Snap beans	Page 24
Fusilade - 250EC and Fusilade II - 125EC	Seedling and established creeping red fescue for seed production	Page 42
Hoe-Grass II	On seedling grasses (bromegrass, creeping red fescue, Russian wild ryegrass, crested wheatgrass and intermediate wheatgrass for seed production.	Page 49
Lannate L	Aphid control on sweet corn	Page 132
Malathion	Grasshopper control on lentils Aphid control on canary seed	Page 135
Sencor	On processing peas	Page 93
Velpar	On established alfalfa (dormant) for seed	Page 112

GLOSSARY OF TERMS IN PEST CONTROL

Acaricides	Pesticides which kill ticks and mites.
Active ingredient(a.i.)	The concentration of chemical in a formulated product that is responsible for action.
Antagonism	Opposing action of different chemicals such that the sum of their total effect is less than the effect if each pesticide were used alone.
Antidote	A first aid treatment to offset the toxic effect of a pesticide.
Bioassay	Determination of concentration of a herbicide by use of a sensitive indicator plant.
Carbamates	Insecticides which kill by temporarily tying up the cholinesterase located between nerves thus interfering with the transfer of messages across nerves.
Carrier	Liquid or solid used to facilitate application of a pesticide.
Chlorotic	Loss or fading of green colour in foliage.
Contact pesticide	Causes localized injury to plant tissue, insect, or other organism only where contact occurs.
Degradation	Breakdown of a pesticide by action of air, water, sunlight microbes or other agents.
Desiccant	Chemical use to accelerate drying of plant tissues.
Efficacy	Effectiveness of chemical on the pest.
Established forage	A forage crop that has gone through three months of a growing season.
Foliar application	Made to the leaves of plants, as opposed to soil application.
Formulation	Form in which the manufacturer prepares a pesticide to facilitate its use - granular, solution, emulsifiable concentrate, dry flowable, liquid flowable, wettable powder.
Fumigant	Vapour active chemical used against pests.
Half-life	Time required to breakdown 50% of a pesticide.
Harvest	Cutting of the crop or removal of the produce from the plant.
Incompatibility	Where one pesticide cannot be satisfactorily mixed with another - Mixture may gel, lose activity, settle out or be phytotoxic.
Inhibit	Prevent or stop a process, e.g. inhibits photosynthesis.
Lime-based herbicide	A granular formulation in which the active ingredient is attached to a lime particle.
Mode of action	The specific mechanism through which a pesticide effects a pest.
Necrosis	Localized death of plant tissue - usually characterized by browning and desiccation.
Organophosphates	Insecticides which kill by tying up almost permanently the cholinesterase located between nerves thus interfering with the transfer of messages across nerves.
Photosynthesis	Process by which green plants use sunlight, carbon dioxide and water to produce plant food
Phytotoxic	Injurious to a plant.
Preharvest Interval (PHI)	Time between the last application of the pesticide and harvest. Harvest includes cutting (swathing) or grazing; it does not include combining or baling for hay.
Residual herbicide	Persists in soil, kills regrowth and/or germinating seedlings over an extended time.
Synergism	Complementary action of different pesticides such that the total effect is greater than the sum of their independent effects.
Systemic pesticide	Able to move in the plant, insect, or other organism from the initial point of contact.
Translocation	Process by which substances move within a plant.

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CHEMICAL WEED CONTROL IN ALBERTA

Chemical weed control functions on the basis that certain chemicals are capable of killing some kinds of plants (weeds) without injury to other kinds (crops). As a group, these chemicals are called herbicides.

Herbicides are effective tools for the control of weeds, and **herbicides demand respect**. When properly used, herbicides can safely and effectively accomplish their objective; misused, they can cause severe economic loss. The misuse of herbicides is usually due to:

1. ignorance of their characteristic activity and/or,
2. carelessness in their application.

Misuse includes such factors as: applying improper dosages; using the wrong herbicide; failure to properly calibrate application equipment; failure to wash application equipment thoroughly before switching herbicides; improper soil incorporation; timeliness of application, with respect to the growth stage of crop or weed.

This guide lists the major herbicides registered for field crop use in Alberta. Refer to product labels, attached to the herbicide containers, for final detailed information.

CONSERVATION TILLAGE AND HERBICIDES

Conservation tillage: is a general term used to describe a cropping program in which some or all of the tillage operations are replaced by using herbicides to control weed growth and at the same time preventing soil erosion and conserving soil moisture. The following terminologies are included under conservation tillage: reduced tillage, minimum tillage, no-tillage or zero tillage, direct drilling, and chemical fallow.

Herbicides for conservation tillage: are listed below. Rates of application, weeds controlled, and other pertinent information can be found by referring to each herbicide in this guide.

1. **2,4-D or MCPA:** To control winter annuals such as flixweed, shepherd's-purse, and stinkweed. Application should be made to emerged weeds prior to freeze-up.

2. **Heritage:** Use in the Brown soil zone only during the fallow year.

3. **Roundup:** Apply Roundup mixed with a non-ionic surfactant to actively growing weeds. Roundup can be tank mixed with Banvel; 2,4-D amine; Pardner.

4. **Rustler (New Improved):** Controls annual grasses, broadleaf weeds, and volunteer cereals. Can be tank mixed with 2,4-D.

5. **Sweep:** Controls annual grasses and broadleaf weeds. Can be tank mixed with Banvel+2,4-D; bromoxynil+MCPA; 2,4-D; Lorox L+MCPA; MCPA. Apply Sweep+Lorox L+MCPA only once per season.

NITRATE POISONING OF LIVESTOCK

Nitrate accumulations may be caused by leaf damage from frost, hail, or herbicide action. Symptoms of nitrate poisoning include reduced milk production and growth rate, abortions; and in severe cases death by suffocation. A veterinarian should be called immediately if livestock show unusual symptoms when they are fed forages which may contain nitrates.

After severe frost, hail, or herbicide damage the nutrient value of the crop will decrease rapidly. In terms of nutrition, it is important to harvest as soon as practical - however in the case of herbicide treated crops there may be a waiting period specified on the herbicide label. Especially in the case of high risk crops, such as oats or corn a delay may be advisable to permit nitrate levels to decrease. If there is a possibility of high nitrates in feed, have it analysed at a feed testing laboratory.

WEED CONTROL IN FORAGE CROPS

Make sure all forages, as well as any companion crops, present in the stand are listed for the intended use on the herbicide label. Follow the label directions on the herbicide container closely, particularly as they relate to stage of crop and weed development, water volume, and grazing and feeding restrictions.

HERBICIDE PERFORMANCE RATINGS

Herbicide performance ratings (numbers in brackets after the names of crops or weeds) are based on data from the Expert Committee on Weeds (Western Section) Research Reports. These numbers are not absolute and therefore, not a guarantee of expected performance. They are meant to be used as as guide when selecting a herbicide.

Tolerance of Crop to Herbicides
The number appearing in brackets following the crop on which each herbicide is registered represents the expected tolerance of the crop to that herbicide. Due to variations in variety, weather, timing and application techniques this number is only approximate. 0 = complete kill of the crop and 9 = no measurable injury to the crop.

Level of Weed Control with each Herbicide
The number appearing in brackets after each weed represents the average level of weed control expected with the herbicide. Due to variation in weather, growth stage, time of day, application technique, etc. this number is only approximate. 0 = no control of the weed and 9.0 = complete kill of the weed. A weed control rating of 7.0 or greater is considered commercially acceptable.

ADVANCE 10G (trifluralin)

DowElanco

(Oilseeds, Special Crops and Barley)

1. **FORMULATIONS:** Granular; trifluralin 10.0%; 22.7 kg bag.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Alfalfa (establishment), canola (rapeseed) (including triazine tolerant) (8.9), dry beans, flax (7.7), lentils (8.5), mustard (8.9), peas (canning, field) (8.9), soybeans*, sunflowers (8.9), fababeans (8.6)
   Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**

bluegrass, annual (8.6)	grass, barnyard (8.3)
bromegrass, downy (5.9)	knotweed
buckwheat, wild (8.3)	lamb's-quarters (8.0)
chickweed (7.1)	oats, wild (7.5)
cockle, cow (9.0)	pigweed (8.2)
darnel, persian	purslane (7.9)
foxtail [green, yellow (8.1)]	thistle, Russian (7.9)

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Spring: Not recommended.
   Summer: Canola (including triazine tolerant), flax. On summerfallow between June 1 and September 1.
   Fall: Alfalfa establishment, canola (including triazine tolerant), dry beans, fababeans, flax, lentils, mustard, peas, soybeans, sunflowers. Between September 1 and soil freeze-up.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Incorporation: First incorporation must be done within 24 hours of application. Second, at right angles to the first, should be delayed a minimum of 3 days. This allows for greater release and more uniform distribution of trifluralin in the soil.
   Fall Application: Both incorporations should be completed in the fall.
   Summer Application: The second (and subsequent incorporations) can be done as necessary to destroy resistant weed growth.
   Flax, Lentils: Both incorporations must be done in the fall. Fall or summer application should be followed by a spring tillage to a 5-8 cm depth before seeding.
   Implements: A tandem disc, discer or field cultivator (Vibrashank) set to cut 5-8 cm deep is required.
   Rate:

Season	Soil Zone; Organic Matter	Soil Texture	Advance 10G
Summer	Brown, Dark brown, Black, Deep Black	Sandy - Sandy loam	NR**
	Brown, Dark brown, Black, Deep Black	Silts to loams to clays	6.9 kg/ac
Fall	Brown, Dark Brown or Black (2-6% O.M.)	Sandy - Sandy loam	4.4 kg/ac
	Brown, Dark Brown or Black (2-6% O.M.)	Silts to loams to clays	5.7 kg/ac
Fall	Black, Deep Black (6-15% O.M.)	Sandy - Sandy loam	5.7 kg/ac
	Black, Deep Black (6-15%) O.M.)	Silts to loams to clays	5.7-6.9 kg/ac*

   *Higher rate for heavy wild oat population.
   **Not recommended.
8. **APPLICATION TIPS:** To avoid concentrating wild oat seeds below the treated layer do not plow land prior to application of Advance 10G. Do not apply to fields spread with manure during the past 12 months. Ensure that after this period the manure has been thoroughly disintegrated and mixed into the soil. Ensure that large clods of soil are broken down prior to application. Advance 10G can be used where track is heavier or on standing weeds provided they do not interfere with the distribution of the granule and do not limit the incorporation of the granule by plugging incorporation equipment preventing the granule from reaching the soil surface. Do not apply on soils that are wet, or poor tilth, or contain more than 15% organic matter. If the previous swath was removed by burning, cultivate once to remove charcoal layer prior to application of Advance 10G. Do not apply on soils subjected to prolonged periods of flooding.
   Flax, Lentils: Shallowly till and pack the soil in spring to ensure a firm seedbed and accurate depth of seeding. Seed into a well packed warm moist seedbed. Do not seed deeper than 4 cm.
9. **HOW IT WORKS:** Kills weed seedlings as they germinate. Inhibits cell division in the actively growing points of root and shoot.
10. **EXPECTED RESULTS:**
    Weeds: Most weeds die before emerging. Weeds will exhibit swelling in the coleoptile region, stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture obtaining ability.
11. **EFFECTS OF RAINFALL:** No effect once trifluralin is incorporated into the soil.

12. **MOVEMENT IN SOIL:** None.
13. **GRAZING AND CROPPING RESTRICTIONS:** Normally, Advance 10G carry over will not harm crops grown in rotation. As a precaution, oats, sugar beets, creeping red fescue, and small-seeded grasses such as timothy and canary seed should not follow an Advance 10G treated crop. Drought conditions in the year of treatment may result in higher levels of trifluralin carry over into the next year. To avoid wheat injury, seed less than 7 cm deep into a warm, moist seedbed. Over-application caused by overlapping or improper calibration or non-uniform application may cuase crop injury. Applying to severely eroded knolls may also cause crop injury.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (10,000). In clean water, fish are very sensitive to trifluralin, but in runoff or muddy water, trifluralin binds to soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce skin and eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medial attention.
16. **STORAGE:** Do not store under direct sunlight. Do not store in granular applicator (24 hours maximum).
17. **RESISTANCE MANAGEMENT** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, HERITAGE**, TRIFLUREX, RIVAL, FREE FLOW and FORTRESS will not control trifluralin tolerant green foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use of these products repeatedly in the same field, or use a separate herbicide application for control of trifluralin tolerant green foxtail.
Note: Similar products are Free Flow, Rival, Treflan and Triflurex.

Special Use: Advance 10G on Barley only - Fall application only (September 1 to soil freeze-up).
Weeds Controlled: Refer to Section 4 (above).
Incorporation: Refer to Section 7 (above).
Rate:

	Advance 10G kg/ac	
Soil Zone; Organic Matter	**Sandy - Sandy Loam**	**Silt to loam to clay**
Brown and Dark Brown (2-4% O.M.)	3.4	4.4
Black (4-6% O.M.)	4.4	5.7

Warning: Do not apply on soils with less than 2% organic matter or, on deep black soil with more than 6% organic matter. Do not apply on land treated with products containing trifluralin since June 1 of the previous year. Application to severely eroded knolls may result in reduced crop stand. Using press or hoe drill, seed 5 cm deep into a moist, warm seedbed. Avoid seeding into very cold soil. Seeding disease, cold weather, improper seeding depth, excessive moisture, high salt concentration, or drought may weaken crop seedings and increase the possibility of damage from Advance 10G.

AFOLAN F (linuron)

Hoechst

1. **FORMULATIONS:** Liquid Flowable; 480 g/L; 10 L jug.
2. **REGISTERED MIXES:** Dual 960 E, MCPA Amine 500.
Mix Restrictions: Use only MCPA amine to avoid crop injury. Avoid very hard water with MCPA mix. Ensure adequate agitation. Use soon after mixing.
3. **CROPS:**

Afolan F			**Afolan F+MCPA Amine**
asparagus (8.7)	corn (field, sweet*)(6.5)	parsnips (7.0)	barley (8.6)
carrots (8.2)	dill (7.2)	potatoes (8.7)	oats (8.9)
celery (9.0)	fruit trees**	shelterbelts*** (9.0)	wheat, spring (8.2)

*Only on gold crest, marcross, merit, preview, seneca explorer, seneca golden, seneca 60, sugar king.
**Apple, cherry, peach, pear, plum, prune-plum.
***Ash (green), caragana, elm (American, Siberian), maple (Manitoba), pine (Scotch, at least 2 years old), poplar, spruce (Colorado, white; at least 2 years old), willow.

4. **WEEDS CONTROLLED:**

Afolan F

barnyard grass (8.3)	groundsel (8.6)	pigweed [prostrate (8.7),	ragweed, common
buckwheat, wild (8.5)	knotweed	redroot (7.9)]	shepherd's-purse (9.0)
chickweed, common (9.0)	kochia (6.4)	plantain, seedling	smartweed, annual (9.0)
dandelion, seedling (6.0)	lamb's-quarters (7.9)	purslane (8.4)	sow-thistle, perennial seedling
foxtail, yellow (6.2)	mustard, wormseed (6.0)	radish, wild	spurry, corn (8.7)
goosefoot (8.4)	panicum, fall		stinkweed (8.5)

Afolan F+MCPA Amine

buckwheat
[tartary(7.9), wild(7.5)]
burdock, common
chickweed, common (7.4)
cockle, cow (6.8)
cocklebur
goat's-beard
hemp-nettle (7.5)
kochia (5.8)
lady's-thumb
lamb's-quarters (8.9)
lettuce, prickly
mustard (ball, hare's-ear, Indian, tumble, wild, wormseed)(8.8)
pigweed [prostrate (8.0), redroot (7.8), Russian]
radish, wild
ragweed [common, giant (9.0)]
shepherd's-purse
smartweeds, annual (7.0)
stinkweed (8.9)
stork's-bill (8.2)

5. **WEEDS SUPPRESSED:** Green foxtail (6.7), field horsetail.

6. **WHEN USED:**

Afolan F

Asparagus, potatoes: Pre-emergent.
Carrots, parsnips, dill: 2 or more leaves; before grassy weeds 5 cm tall, broadleaf weeds 15 cm.
Celery transplants: As soon as new growth starts.
Corn (field, sweet): Before corn emerges or as a directed spray on weeds after corn is at least 38 cm tall.
Fruit trees: Directed spray around trunk of trees established at least 10 years, peaches 1 year.
Shelterbelts: Before or immediately after weeds emerge, before 15 cm tall; no earlier than 10 days after transplanting. After buds open, apply as a directed spray. Keep chemical off the leaves. Pine and spruce must be at least 2 years old.

Afolan F+MCPA Amine

Barley, oats, wheat (spring): When crop in 2-4 leaf; weeds in 1-4 leaf. Do not apply after tillering.

7. **HOW TO APPLY:**

With: Ground equipment.

Application Method:

Afolan F: 80-160 L/ac except on shelterbelts and fruit trees: directed spray required.

Afolan F+MCPA Amine: 40 L/ac water - 275 kPa - 9 km/h. Screens 50 mesh or larger - 80° flat fan nozzles - adequate agitation required.

Rate: Barley, oats, wheat (spring): Afolan F 190-240 mL/ac + MCPA Amine 445 mL/ac.

Afolan F (L/ac)

Crop	Muck or Clay Medium O.M.	Loam or Clay Low O.M.	Crop	Muck or Clay Medium O.M.	Loam or Clay Low O.M.
Asparagus	1.9	1.4	Corn (pre)	1.5-1.9*	1.01-1.52*
Carrots, dill,parsnip (pre)	0.77-1.01	0.53-0.77	Corn (post)	1.01-1.52*	1.01-1.52*
Carrots, dill,parsnip (post)	0.77-1.9	0.77-1.9	Fruit trees	3.8	3.8
Carrots, dill, parsnip (pre+post)	0.53-0.77, then 0.77-1.01	0.77-1.01	Potatoes (pre)	1.5-1.9	1.01-1.52
			Potatoes (pre)	0.9 + 1.11 L/ac Dual 960 E	0.72 + 0.81 L/ac Dual 960 E
Celery (post)	0.77-1.9	0.53-0.77	Shelterbelts	1.9-3.8	1.9-3.8

*Use lower rate when weeds do not exceed 5 cm.

8. **APPLICATION TIPS:** Early application will avoid crop injury. Barley may suffer growth suppression, maturity delay and yield reduction which may be offset by control of heavy weed growth. Make only 1 Afolan F application per crop year. Do not apply to crops under drought, heat or frost stress.

9. **HOW IT WORKS:** Afolan F: both systemic and contact, absorbed by roots and leaves. MCPA: systemic, absorbed by leaves.

10. **EXPECTED RESULTS:** First, browning of older leaf tips, then water soaked, wilted appearance, progressive yellowing, stem collapse, browning and death. MCPA promotes stem bending, twisting, leaf cupping. **Poor results may be expected** if incorrect timing of application, stress conditions, crusted soil, or rain immediately after spraying.

11. **EFFECTS OF RAINFALL:** Requires rainfall or irrigation for activation of pre-emergent applications. Rainfall within 1 hour may decrease post-emergent effect. Unusually heavy rains after a pre-emergent application may cause severe injury to corn, carrots, or parsnips.
Afolan F+MCPA Amine: Rainfall within 4 hours will detract from results.

12. **MOVEMENT IN SOIL:** Higher rates of Afolan F and extreme moisture may cause some leaching.

13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or feed green plants to livestock. Do not apply within 60 days of harvest. No restriction on succeeding crops except if 2.0 L/ac or more is applied (possible 25% carry over to next season).

14. **TOXICITY:** Very low mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (4,000). May irritate eyes, skin, nose and throat. Toxic to fish.

15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.

16. **STORAGE:** Do not store below 5°C. If stored for 1 year or longer, shake well before using.
Note: Similar products Lorox and Linuron 400L are also listed.

ALLY (metsulfuron methyl)

DuPont

CAUTION POISON

1. **FORMULATIONS:** Dry Flowable; 60%; 122 g container.
2. **REGISTERED MIXES:** 2,4-D Amine 500 (340-450 mL/ac + surfactant); MCPA Amine 500 (280-450 mL/ac + surfactant); 2,4-D LV Ester 700 (240-320 mL/ac + surfactant); Avenge 200C (1.4 - 1.7 L/ac; do not use surfactant with this tank mixture)
   Surfactants: Ag-Surf, Agral 90, Citowett Plus, Super Spreader-Sticker, Triton XR.
   Mix Instructions: Add 1/2-3/4 required amount of water. While agitating, add Ally and ensure it is completely suspended. Complete filling, then add surfactant. Continuous agitation is required.
3. **CROPS:** Barley, wheat (durum, spring).
   *Not recommended for underseeding.
4. **WEEDS CONTROLLED:**

Ally 3 g/ac (alone):

bluebur	flixweed (6.6)	mustard [ball, wild (8.3)]	shepherd's-purse (8.5)
buckwheat, tartary (8.3)	hemp-nettle (8.2)	pigweed, [prostrate, redroot (9.0)]	smartweed, green (7.2)
chickweed (8.6)	kochia (8.0)	rapeseed, volunteer (8.6)	stinkweed (8.1)
cockle, cow (8.8)	lady's-thumb (8.2)		

Ally 2-3 g/ac + MCPA:

annual sunflower	flixweed	mustard (ball, tumble, wild, wormseed)	shepherd's-purse
bluebur*	hemp-nettle	pigweed (prostrate*, redroot, Russian)	smartweed, green
buckwheat (tartary*, wild)	kochia	plantain	stinkweed
chickweed	lady's-thumb*	prickly lettuce	sweet clover
cockle, cow	lamb's-quarters	rapeseed, volunteer	thistle, Russian

Ally 2-3 g/ac + 2,4-D:

annual sunflower	hemp-nettle	narrow leaved hawk's-beard	shepherd's-purse
bluebur*	kochia	(spring seedlings only)	smartweed, green
buckwheat* (tartary, wild)	lady's-thumb*	pigweed (prostrate*, redroot, Russian)	sow-thistle*
chickweed	lamb's-quarters	plantain	stinkweed
cockle, cow	mustard (ball, wild,	prickly lettuce	sweet clover
flixweed	wormseed)	rapeseed, volunteer	thistle (Canada*, Russian)

*Weeds controlled only when mixtures contain Ally at 3 g/ac.

5. **WEEDS SUPPRESSED: Ally (alone) 3 g/ac:** Buckwheat (wild (6.4)), lamb's-quarters (7.7), sow-thistle [annual (8.6), perennial], thistles [Canada (6.8), Russian (7.8)]. **Ally 2 g/ac + 2,4-D:** Buckwheat (wild), sow-thistle, Canada thistle.
6. **WHEN USED:** Barley, wheat (durum, spring): 2 leaf to flag leaf stage. When mixing with 2,4-D or MCPA apply from the full 3 leaf to flag leaf stage of wheat or barley. Best results are when applied to first main flush of young, actively growing weeds. Do not use in soils with pH greater than 7.9.
7. **HOW TO APPLY:**
   With: Ground equipment. Do **not** apply by air.
   Sprayer Cleanup: To avoid injury to susceptible crops thoroughly clean sprayer immediately after spraying: Ammonia must be used to deactivate Ally when cleaning equipment.
   (1) Drain and flush tank, boom and hoses with clean water for a minimum of 10 minutes.
   Visually inspect tank to assure removal of all visible residues of Ally. If necessary, repeat step 1.
   (2) Fill tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water to completely fill tank.Allow to sit for 15 minutes with agitation. Again flush the hoses, boom and nozzles with the cleaning solution and drain tank.
   (3) Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
   (4) Repeat Step 2.
   (5) Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.
   Caution: Do **not** use ammonia with chlorine bleach. Using ammonia with chlorine bleach will release a gas with a musty chlorine odour which may cause eye, throat and lung irritation. Do not clean equipment in an enclosed area. Do not clean sprayer near well or water source or near to desirable vegetation.
   Rate: When used alone: Ally 3 g/ac. When used with 2,4-D or MCPA: Ally 2-3 g/ac.
   Surfactant: 2 L/1000L spray solution. **Water Volume:** 40 L/ac (minimum).
   Pressure: 275 kPa. **Nozzles:** Flat fan types. 50 mesh or larger screens. Only metal or nylon filters.
8. **APPLICATION TIPS:** Wild Oat herbicides require a 4-5 day interval before or after an application of Ally. Effectiveness may be reduced if spray mixture remains in tank for more than 24 hours.
9. **HOW IT WORKS:** Absorbed by foliage and roots. Inhibits cell elongation.
10. **EXPECTED RESULTS:** Weed growth stops almost immediately. **Poor results may be expected if** improper mixing, timing, coverage, or when weeds are under drought stress.
11. **EFFECTS OF RAINFALL:** Heavy rainfall immediately before or after application may cause temporary lightening of crop. Rainfall within 4 hours of application may lessen degree of weed control.
12. **MOVEMENT IN SOIL:** Movement is restricted by fine textured soils, soil organic matter and neutral to acidic conditions.

13. GRAZING AND CROPPING RESTRICTIONS:

Grazing Restrictions: Wheat or barley may be grazed by or fed to livestock any time after treatment.

		Minimum Recropping Intervals (months)*	
Crops for Rotation	**Soil pH**	**Black/Grey Wooded Soils**	**Brown/Dark Brown Soils**
Oats	6.9 or lower	10	10
Oats	7.0 to 7.9	10	22
Barley, wheat, durum	7.9 or lower	10	10
Fescue	7.5 or lower	10	Field bioassay
Canola, Flax	6.9 or lower	10	22
Canola	7.0 to 7.9	22	34
Flax	7.0 to 7.9	34	34
Lentils	6.9 or lower	34	34
Lentils	7.0 to 7.9	48	48
Alfalfa, Red clover, Peas	7.5 or lower	22	Field bioassay
All other crops	7.9 or lower	Field bioassay	Field bioassay

*Wherever Ally is used on land previously treated with Glean, read the rotational guidelines on both labels. If land has been treated with Ally and Assert the same year or in successive years, seed only wheat until a field bioassay demonstrates that other crops can be seeded.

14. TOXICITY: Low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (greater than 5,000.)

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.

16. STORAGE: Store in a cool, dry place.

17. RESISTANCE MANAGEMENT: To delay selection of resistant weeds, rotate the use of Glean, Ally, Muster and Refine with other herbicides that are also effective on the same weeds. Also, where appropriate, use tank mixtures of Ally and other herbicides except Glean, Muster and Refine, that are also effective on those weeds.

AMITROL-T (amitrole)

Rhône - Poulenc

WARNING POISON

1. FORMULATIONS: Liquid; 200 g/L; 1 L, 10 L containers.

2. REGISTERED MIXES: None.

3. CROPS: Non-crop areas (fence rows, ditchbanks, roadsides), pastures, shelterbelts. Pre-plant: Beans (white), corn. Post-harvest: grain, peas. After final cutting: alfalfa, clover.

4. WEEDS CONTROLLED:

cattails	milkweed, showy	sow-thistle (annual, perennial)	thistle, Canada (7.4)
cress, hoary	quackgrass	spurge, leafy	toadflax
horsetail, field			most annual weeds

5. WEEDS SUPPRESSED: None.

6. WHEN USED:

Alfalfa, asparagus, clover: After final cutting, **not** after October 1.
Corn, beans (white): Pre-planting.
Crops: Non-selective, spot treatment.
Grain, peas: Post-harvest, **not** after October 1.
Shelterbelts: In established plantings only.
Cattails: After catkins are fully formed up to frost.
Cress (hoary), spurge (leafy): During advanced rosette and bud stages.
Horsetail: During vigorous growth.
Milkweed: Early summer when all shoots have emerged.
Quackgrass: 15-20 cm tall.
Thistles: Early bud to bloom.
Toadflax: Advanced rosette to pre-bud.

7. HOW TO APPLY:

With: Ground equipment: hand sprayer.
Water Volume: Non-crop areas: 405 L/ac minimum.
Crop areas: 80-200 L/ac; Asparagus: 405-810 L/ac; Shelterbelts: 405 L/ac.
Pressure: 150-275 kPa.

Rate:

Non-crop areas	**L/ac**
Cress, milkweed, quackgrass, toadflax, thistles.	9-14
Cattails, spurge.	18-22
Crop areas	
Alfalfa, clover (after final cut).	8.9-10
Asparagus (after final cut).	8.9
Beans, corn (pre-plant) - quackgrass, Canada thistle.	6.9-8.9
Corn (pre-plant) - annual weeds, quackgrass.	5.25
Grain, peas (post-harvest).	8.9-10
Shelterbelts	8.9-14
Spot treatment of regrowth	1/2 of original rate.

8. **APPLICATION TIPS:** Spray to point of runoff, complete coverage of weeds essential. Under or around desirable plants or trees; avoid contact with foliage, green stems, or fruit as severe injury or destruction may result. Use a hooded sprayer if necessary. Do not disturb or mow treated plants for at least 2 weeks after treatment. If practical, till 2-3 weeks after treatment. If no tillage is possible, then spot treat weed regrowth with 1/2 original rate. Do not apply where water will be used for irrigating, drinking, or other domestic use. Do not spray near sparks or open flame.
9. **HOW IT WORKS:** Systemic herbicide which inhibits chlorophyll production. Moves through foliar and root system.
10. **EXPECTED RESULTS:** Whitening begins in 7-14 days and plants die. Short term residual. **Poor results may be expected if** poor coverage, inadequate rate, plants over mature or under drought stress. Tillage too soon after application.
11. **EFFECTS OF RAINFALL:** Heavy rain within 6-8 hours reduces effectiveness.
12. **MOVEMENT IN SOIL:** At recommended rates - persists in soil 4-6 weeks.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze treated alfalfa or clover for 8 months. Do not graze other treated areas for 6 months. Most crops susceptible to drift.
    Succeeding Crops: After post-harvest treatment of grain, peas, alfalfa, or clover do not plant to crop for 8 months.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical amitrole (24,600), technical ammonium thiocyanate - carrier (764). May be irritating to skin and eyes; has potential to cause health problems after prolonged, continuous exposure. Non-toxic to fish and birds.
15. **PRECAUTIONS, FIRST AID:**
    Caution: Suspected cancer causing agent.
    Do not apply on foraging bees. Do not spray near sparks or open flame. Wear standard protective clothing (see page xx) to avoid exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Do not freeze or store above 30°C. No shelf life limitation. If frozen, contents will crystallize - to resuspend warm to 27°C and agitate as necessary.

ASSERT 300 (imazamethabenz)

Cyanamid

CAUTION POISON

1. **FORMULATIONS:** Liquid concentrate 300 g/L; suspension concentrate 300g/L; 10.8 L pail.
2. **REGISTERED MIXES:** MCPA ester and 2,4-D ester.
   Mixing Restrictions: Use only 0.67 L/ac of **Assert** when tankmixing with MCPA or 2,4-D ester. Do not tank mix with phenoxy amines.
   Mix rates: MCPA Ester (500 g/L) up to 0.45 L/ac.; 2,4-D Ester (600 g/L) up to 0.19 L/ac.
   Black and grey wooded soil zones: 1- 4 leaf stage of wild oats - use only 0.67 L/ac of Assert when tank mixing with MCPA or 2,4-D ester.
   Brown and dark brown soil zones: 1 - 3 leaf stage of wild oats - use 0.54 L/ac of Assert when tank mixing with MCPA or 2,4-D ester; 4 leaf stage of wild oats: use only 0.67 L/ac of Assert when tank mixing with MCPA or 2,4-D ester.
3. **CROPS:** Barley: all varieties (8.5). Wheat [spring (8.8), durum (8.3)]: all varieties.
4. **WEEDS CONTROLLED:** Mustard, wild (7.8); oats, wild (7.8); and stinkweed (8.2).
5. **WEEDS SUPPRESSED:** Wild buckwheat (5.4) and tartary buckwheat (3.5).
6. **WHEN USED:** 1-3 leaf stage of the wild oats to minimize early wild oat competition. Very good control at 4-leaf stage. Application can be made up to and including the 6-leaf stage of the crop (before the flag leaf). Do not apply Assert within five days of any herbicide which is not a registered tank mix with the exception of Estaprop, Lontrel, Laser and Diphenoprop 600.
7. **HOW TO APPLY:**
   Water: Use Assert with the pH reducing agent Spraywater pH Adjuster or poor weed control may occur.
   With: Ground equipment only.
   Water Volume: 40 L/ac.
   Incorporation: Not applicable.

Pressure: 275 kPa.
Nozzles: Flat fan recommended; tilted 45° forward for better penetration. 50-mesh screens and filters.
Rate:

Wild Oat Stage	Assert
1-3 leaf	0.54 L/ac
4 leaf*	0.67 L/ac

* or when tank mixing in the black and grey wooded soil zones.

8. **APPLICATION TIPS:** Do not spray if freezing temperatures are forecast. **Do not apply Assert to the same field two years in a row.**
9. **HOW IT WORKS:** Absorbed by foliage and roots. Disrupts plant metabolism causing growth to stop. Best at high temperature.
10. **EXPECTED RESULTS:**
    Wild Oats: Stop growing within 24-48 hours. Yellow striping and purplish discolouration of the leaf may occur. Leaves begin to die in 3-10 days starting with the youngest and moving to the older leaves. Death of the plant may occur in 1-3 weeks. Symptoms may occur more slowly at lower temperatures and high rainfall. Better control at the high rate in the black and grey wooded soil zones.
    Stinkweed and wild mustard: Begin to yellow and die in 3-10 days; usually die before the wild oats.
    Wild and tartary buckwheat: Will slow or stop growth. Competition from these weeds will be reduced.
11. **EFFECTS OF RAINFALL:** Rainfall within 3 hours may decrease activity.
12. **MOVEMENT IN SOIL:** Is not leached appreciably.
13. **GRAZING OR CROPPING RESTRICTIONS:** Fields treated with Assert may be grazed, cut for hay and fed to livestock after harvest.
    Succeeding crops:
    Black and grey wooded soil zones: Rotate only to wheat (spring and durum), barley, sunflower and canola the year following Assert.
    Brown and dark brown soil zones: Rotate only to wheat (spring and durum), barley and sunflowers the year following Assert. Two years after application of Assert, the following crops can be grown in all soil zones: wheat (spring and durum), barley, sunflower, peas, canola, flax, oats and canary grass. Conduct a field bioassay before planting lentils or sugarbeets.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (3,078). Non-toxic to fish, birds or bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Will withstand freezing temperatures, returning to full solution as temperature increases.

ATRAZINE

Ciba-Geigy/United Agri Products

1. **FORMULATIONS:**
   Liquid: Aatrex Liquid (Ciba-Geigy); 480 g/L; 2 X 10 L jug.
   Granular: Aatrex Nine-0 (Ciba-Geigy); 90%; 5 X 5 kg pack.
   Flowable: Atrazine 500 (U.A.P.); 500 g/L; 2 x 10 L pack.
   Wettable Powder: Atrazine 90W (U.A.P.); 90%; 4 x 4 kg/case; 4 x 4.5 kg/case.
2. **REGISTERED MIXES:**
   Aatrex Nine-O, Aatrex Liquid: Crop oil concentrate, nitrogen solutions or complete liquid fertilizers, Dual Ciba-Geigy 960E, Bladex, Sutan+.
   Atrazine 500, Atrazine 90W: Crop oil concentrate, nitrogen fertilizer solutions, or complete liquid fertilizers, Bladex, Sutan+
   Mixing Restrictions: Do not mix oil concentrates, surfactants or hormone type herbicides with any mixture of Atrazine plus Bladex. Tank Mixes: add water, then Atrazine, agitate, add Bladex slowly, agitate thoroughly.
3. **CROPS:** Corn [(Field (9.0), Sweet (8.6)], non-crop (Consult manufacturer for directions).
4. **WEEDS CONTROLLED:**

Atrazine

buckwheat, wild	lady's-thumb	pigweed, redroot
clover, volunteer	lamb's-quarters	purslane
foxtail (green, yellow)*	mustards	ragweed
grass (barnyard, quack)	oats, wild	smartweeds, annual
		thistle, Canada

Atrazine+Dual Ciba-Geigy
foxtail (green, yellow)

Atrazine+Sutan+
foxtail (green, yellow)

*Post-emergent.

5. **WEEDS SUPPRESSED:** None.

6. **WHEN USED:**
Aatrex Nine-O, Aatrex Liquid, Atrazine 500, Atrazine 90W: Pre-plant, pre-emergent, post-emergent or band applied.
7. **HOW TO APPLY:**
With: Ground equipment.
Rate:
Aatrex Liquid: 1.3-2.7 L/ac.
Aatrex Liquid: 1.3-1.8 L/ac + 6.9 L/ac emulsified oil in 60-120 L/ac of water.
Aatrex Nine-O: 0.8-1.5 kg/ac;
Atrazine 90W: 0.81-1.00 kg/ac.
Atrazine 500: 1.3-2.84 L/ac.
Note: Vary rates according to different soil types.
Canada Thistle and Quackgrass Control: Aatrex liquid (1.8 L/ac) or Aatrex Nine-O (1 kg/ac) + emulsified oil (6.9 L/ac) to foliage in fall or early spring. Cultivate 1-3 weeks later, plant corn. Repeat chemical treatment as early post-emergent.
Water Volume: 60-120 L/ac.
Incorporation: Only Aatrex Liquid, Atrazine 500, Atrazine 90W, Aatrex Nine-O are applied pre-plant; Do not incorporate deeper than 5.0 cm. Pre-emergent treatments require rainfall within 10 days or a light cultivation.
Pressure: 200-300 kPa.
8. **APPLICATION TIPS:** Continuous gentle agitation is needed. Avoid excessive agitation, especially with oil mixtures, as a grease like mass may form. Use oil mixes at once and clean tank and system with a strong detergent solution. Use 50 mesh or larger strainers and use only metal filters. Bypass line should discharge to bottom of tank. Band treatments are desirable when cultivation is to alleviate hard soil conditions or to control annual weeds.
9. **HOW IT WORKS:** Inhibits photosynthesis.
10. **EXPECTED RESULTS:** Weeds slow to emerge or under drought conditions will be killed when moisture improves. Heavy rainfall on sandy soils may cause leaching, a decrease in efficacy and off target injury.
11. **EFFECT OF RAINFALL:** Rainfall will activate the chemical, carrying it into the root zone where kill will begin.
12. **MOVEMENT IN SOIL:** Heavy rainfall on sandy soils may cause leaching and soil movement.
13. **GRAZING AND CROPPING RESTRICTIONS:** Plant only to corn in year of treatment. The use of atrazine on the prairies is not recommended when corn is grown in rotation with other crops except triazine tolerant canola. Breakdown of atrazine in the soil is slow and may cause injury to sensitive crops (e.g. cereals, canola, sugar beets) one or more years after application. Crops most tolerant after corn and triazine tolerant canola are sorghum, then flax, faba beans, and peas. The risk of damage to succeeding crops from atrazine residues may be reduced by ploughing or deep tilling treated fields in the fall prior to seeding the next crop in the rotation. Spreading and incorporating manure may also help to reduce the atrazine levels. Uneven application, excessive sprayer overlap, or applications in excess of recommended rates will not injure corn but may result in a longer carryover of atrazine residues. A prolonged period of hot dry weather will also lengthen the time that atrazine residues remain in the soil.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (1,859-3,080). May cause eye irritation. Very low toxicity to fish and birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake may cause convulsions and coma.
16. **STORAGE:** The flowable formulations should be kept from freezing. If stored in unheated areas the product should be warmed and agitated thoroughly prior to using.

AVADEX BW (triallate)

Monsanto

WARNING POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; Avadex BW Liquid; 400 g/L; 22.7 L pail. Granular; Avadex BW Granular; 10%; 22.7 kg bags.
2. **REGISTERED MIXES:** Rival or Treflan (barley, wheat), dry bulk or liquid fertilizers.
Mixing Instructions: Thorough mixing is essential. Agitation is required to suspend mixture, or to resuspend if spray mixture is allowed to settle at anytime.
Mixing Restrictions: Do not mix with nitrate fertilizers, they may cause explosions and fires.
3. **CROPS:**

barley (8.9)	rapeseed (8.2)
flax (8.9)	sugar beets (8.0)
mustard (9.0)	wheat (8.3)
peas (field)(9.0)	(durum, spring)

Underseeding: Alfalfa, bird's-foot trefoil, clovers; provided they are not harvested for green feed, silage or hay in year of seeding. Do not undeeseed with grasses or legume-grass mix.

4. **WEEDS CONTROLLED:** Oats, wild (7 6).
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
Spring: Pre-plant incorporated on flax, mustard, peas, rapeseed, sugar beets. Pre-plant and post-plant incorporated on barley and wheat. Do not apply pre-plant with wheat in soils with 4% or less organic matter where discers are to be used for the seeding operation. Seed to the proper depth immediately or up to 3 weeks after application.
Fall: All crops. Granules: September 15 to freeze-up. Liquid: October 1 to freeze-up.
Note: For fall applications: where erosion may be a problem, maximize crop residue cover with only one fall tillage incorporation.
7. **HOW TO APPLY:**
With: Aircraft (granules only) or Ground equipment.
Water Volume: Liquid formulation only: 36 L/ac minimum.
Incorporation:
Avadex BW: Two incorporations at right angles are required for thorough mixing. On stubble, incorporate with double disc or cultivator followed by harrowing at right angles. On fallow, use 2 harrowings at right angles if the soil is loose and free of trash and lumps. Do not incorporate into wet soil.
Liquid: The first incorporation should be completed as soon as possible on the day of spraying.
Granules: The first incorporation should be completed within 48 hours of application. The second incorporation for both liquid and granules may or may not be done immediately after the first. For maximum results from spring application of granules, delay second incorporation for at least 3-5 days.
Avadex BW + Fertilizer:
Spring: All crops. Only pre-plant incorporated applications recommended. Incorporate immediately after spreading. For best results delay second incorporation for at least 24 hours.
Fall: Applications should be followed immediately by a shallow discing or cultivation. In the spring prior to seeding, a shallow cultivation at right angles to the fall operation is recommended.
Implements: Operate incorporation equipment at 9 km/h. Use a double disc or light cultivator, to a depth of 7.5 cm, plus harrows for pre-plant incorporation. Heavy duty harrows must be used for post-plant incorporation. Straw, lumps of soil, etc. dragged by harrows will cause uneven incorporation resulting in reduced wild oat control.
Pressure: Liquid formulation only: 200 kPa.
Rate:
(A) Spring Application

Crops	Application Timing	Organic Matter 4% or Less		Organic Matter Greater than 4%	
		Liquid L/ac	Granules kg/ac	Liquid L/ac	Granules kg/ac
Barley	Before and after seeding	1.4	5.7	1.7	6.9
Flax, mustard, rapeseed, sugar beets.	Before seeding	1.7	6.9	2.2	8.9
Peas (dry)	Before seeding	1.7	NR*	1.7	NR
Wheat (durum, spring)	Before seeding	1.2	4.4	1.4	5.7
	After seeding	1.4	5.7	1.7	6.9

*NR-Not Registered

(B) Fall Application

Crops	Organic Matter Less than 2%		Organic Matter 2-4%		Organic Matter Greater than 4%	
	Liquid L/ac	Granules kg/ac	Liquid L/ac	Granules kg/ac	Liquid L/ac	Granules kg/ac
Barley	1.2	4.4	1.4	5.7	1.7	6.9
Flax, mustard, rapeseed, sugar beets.	1.4	5.7	1.7	6.9	2.2	8.9
Wheat (durum, spring)	1.2	4.4	1.4	5.7	1.7	6.9

8. **APPLICATION TIPS:**
Choice of Formulation: Use liquid formulation on soils free of trash. Use granules on all soils including those with heavy trash cover. Granules may be applied in the fall prior to or in conjunction with fertilizer banding.
Field Preparation: Make sure the soil is in good working condition. Reduce trash to an acceptable level before application. If soil is excessively wet or lumpy, cultivate with suitable equipment to improve soil condition.
Seeding: Flax, mustard, and rapeseed can be seeded in treated layer. Barley and wheat are more sensitive and should be planted 6.0-7.5 cm. Wheat must be seeded below the treated layer. After seeding, any deep ridges left by drills must be levelled by harrowing. Treflan/Rival Mixes: Drought conditions in the year of treatment may result in higher levels of Treflan/Rival carry over. To avoid wheat injury, seed 6.0-7.5 cm into warm, moist seedbed.
9. **HOW IT WORKS:** Absorbed by wild oat shoots, usually resulting in death before emergence. Under dry conditions wild oats may emerge before being killed.
10. **EXPECTED RESULTS:**
Wild oats: Usually kills wild oats before they emerge. Scraping away the soil 1-2 weeks following treatment will expose white to yellow wild oats shoots 2.0-2.5 cm in length with pinched tips. Plants which have emerged and absorbed a lethal dose will cease growth, leaves become brittle and bluish-green in colour. Under dry conditions, a rainfall of 1.5 cm or more when wild oats are emerging, can cause post-emergent die-back of a high percentage of wild oat plants.

Crop: Wheat seeded into the treatment zone under very dry soil conditions may be thinned and delayed when germinating and emerging just prior to a heavy rainfall. Wheat must be seeded at least 1.5 cm below the treated layer of soil (eg. 5-7.5 cm). Some wheat thinning may be noted on eroded knolls. **Poor results may be expected if** incomplete incorporation due to wet, cloddy soil, or heavy trash. Incorporation delayed, very dry soil conditions, in spring or prolonged cool soil temperatures at time of germination. Ridges left by seeding may disrupt the treated layer and allow escapes. Equipment deficiencies such as very light harrows.

11. **EFFECTS OF RAINFALL:** Moisture is required for activation. Rainfall of at least 1.5 cm within 2 weeks of application, in the spring, is required to ensure maximum performance.
12. **MOVEMENT IN SOIL:** Negligible.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Drift: No effect on standing crops.
    Grazing Restrictions: Treated underseeded legumes can not be harvested for green feed, silage, or hay in year of seeding.
    Crop Use After Hail: No restrictions.
    Succeeding Crops: Oats should not be seeded into soil treated with Avadex BW in the previous year.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (1,675-2,165). May cause slight eye irritation. Slightly toxic to fish. Non-toxic to birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) to avoid getting chemical on skin or in the eyes. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store above 0°C. If frozen, warm to 22°C and agitate to redissolve crystals.

AVENGE 200-C/280/640 (difenzoquat)

Cyanamid

DANGER POISON

1. **FORMULATIONS:** Liquid; Avenge 200-C; 200 g/L; 20 L pail, Avenge 280; 280 g/L; 10.1 L pail. Soluble Powder; Avenge 640; 640 g cation/kg; 20 kg pail.
2. **REGISTERED MIXES:** Ally[1], Buctril M[1], Cobutox 400[1,3], Diphenoprop 600[1], 2,4-D Butyric 400[1,3], 2,4-D Ester[1], Emoutox 625[1,3], Estaprop[1], Glean[1], MCPA Ester[1,2], Pardner[1] and Refine[1]. (1 = Avenge wheat varieties and barley, 2 = canary grass, 3 = Avenge wheat varieties and barley underseeded to forages.)
   Mix Instructions: Add 1/2-3/4 required amount of water; start agitation, add broadleaf herbicide, then rest of water, then Avenge. Follow Glean label when tank mixing. Ensure Glean is thoroughly dissolved before adding Avenge. Do **not** add surfactant to Avenge 200-C/280+Glean. Avenge 640 alone or in mix requires surfactant (Agral 90 or Ag-Surf). If foaming is a problem, add a silicone anti-foaming agent.
   Mix Restrictions: Do **not** mix with MCPA amine; dicamba (Banvel) or Target; or 2,4-D amine.
3. **CROPS:**
   Barley (8.7): all varieties.
   Canary grass (8.4).
   Fall Rye (8.6): Cougar, Frontier, Kodiak, Puma, Rymin.
   Spring Wheat (8.4): Benito, Canuck, Chester, Columbus, Conway, Fielder, Genesis, Glenlea, HY320, Katepwa, Kenyon, Lancer, Leader, Macoun, Neepawa, Oslo, Selkirk. Do not use on Laura, Park, Roblin, Saunders, Thatcher or any other varieties not listed above.
   Triticale (9.0): Carman, Welsh.
   Winter Wheat (8.7): Norstar, Sundance.
   Forages Underseeded to Wheat or Barley: Alfalfa (7.9), bird's-foot trefoil, bromegrass(7.9), clover [red (7.2), sweet (7.6)], crested wheatgrass (7.0), fescue [creeping red (7.8), red, meadow (7.4)], Kentucky bluegrass, orchard grass (7.8), reed canary grass (7.0), Russian wild ryegrass (6.5), timothy (5.1). Do not treat underseeded legumes if they are to be grazed or used for feed.
4. **WEEDS CONTROLLED:** Wild oats (7.5).
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Very good control at 4-5 leaf stage but yield increases may be reduced. 3-4 leaf stage to minimize early wild oat competition, and maximize yield increases. Do not apply to barley, wheat or canary seed after 6 leaf stage of crop. Do not use Avenge+Glean in the brown soil zone. Use Avenge+Glean on soils with a pH of 7.5 or lower.
7. **HOW TO APPLY:**
   With: Aircraft or Ground equipment. Do not apply Ally, Glean or Refine in tank mixtures with Avenge by air.
   Water Volume:
   Avenge 200-C/280: Air: 8 L/ac minimum; Ground: 40 L/ac; Spra-Coupe: 40 L/ac.
   Avenge 640: Air: 8-20 L/ac; Ground: 40 L/ac.
   Incorporation: Not applicable.
   Pressure: 275 kPa.
   Nozzles: Flat fan recommended; tilted 45° forward for better spray penetration. 50 mesh metal screens and filters.

Rate:

Wild Oat Infestation Level	200-C	280	Avenge 640 g/ac + Agral 90 or Ag-Surf (mL/ac)		
	Air or Ground	Air or Ground		By Air	By Ground
1-200 plants/m^2	1.4 L/ac	1.0 L/ac	445	+ 50-120	+ 245
Over 200 plants/m^2	1.7 L/ac	1.2 L/ac	525	+ 50-120	+ 245

Mix Rates: MCPA ester: Up to 0.45 L/ac. 2,4-D ester 600: 0.55 L/ac. Ally, Glean and Refine: Use high rate of Avenge. Others: Label recommended rate.

8. **APPLICATION TIPS:** Do not apply if the crop is stressed from extreme drought or excessive moisture. Do not spray if freezing temperatures are forecast. Avenge can be sprayed if leaf surface is wet, as long as the spray solution will not drip off of the leaf surface after application.
9. **HOW IT WORKS:** Acts on the growing point located at or just above the soil surface, placing herbicide at or below this point is most efficient. Distrupts cell division and elongation causing growth to stop. Best at high temperature and humidity.
10. **EXPECTED RESULTS:**
    Wild oats: Start to yellow within 3-5 days. Effect is faster when temperature and humidity are high. Affected plants will turn brown or remain stunted and partially green throughout the season. Wild oats in the 1-2 leaf stage at spraying or those that emerge after spraying will be unaffected.
    Crop: Slight yellowing may be visible 5-7 days after application and will remain visible for 2 weeks. **Poor results may be expected if** spraying before 3 leaf stage; too low a rate for wild oat population; inadequate coverage due to dense broadleaf weeds; drought or temperature stress.
11. **EFFECTS OF RAINFALL:** Rainfall within 6 hours will seriously decrease activity.
12. **MOVEMENT IN SOIL:** Is strongly absorbed to soil particles, is not leached, nor carried in runoff appreciably.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Drift: Only oats can be seriously affected by drift.
    Grazing Restrictions: Do not graze or feed crop for 8 weeks after treatment. Treated underseeded forages should not be grazed or harvested for feed during the year of seeding.
    Crop Use After Hail: Do not process for 8 weeks after treatment.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (506-691). Non-toxic to fish, birds or bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles to prevent contact with skin and eyes.
    Symptoms of poisoning: Headaches, tiredness and diarrhea. No long term health problems noted.
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Will withstand freezing temperatures, returning to full solution as temperature increases.

BANVEL (dicamba)

Sandoz Agro

CAUTION POISON

1. **FORMULATIONS:** Solution 480 g/L; 5 L, 9.5 L jug.
2. **REGISTERED MIXES:** 2,4-D (amine, LV ester)(not on canary seed or oats); Rustler (chemical fallow); Lexone or Sencor (barley, spring wheat); MCPA Amine (barley, canary seed, oats, wheat); MCPA K-Salt (barley, oats, wheat); Roundup (reduced tillage); Sweep (chemical fallow).
3. **CROPS:**

barley (8.2)	grasses (established turf,	reduced tillage
canary seed	pasture, rangeland)	rye, spring
corn, field	non-crop areas	stubble, summerfallow
fescue, red (seed crops)	oats (8.6)	wheat (durum, spring, winter)(8.2)

4. **WEEDS CONTROLLED:**
   Banvel Alone (Crop rates): Banvel tank mixes control these weeds + those controlled by the other herbicide.

buckwheat	cockle, cow (6.9)	smartweeds, annual (6.4)
[tartary(6.7), wild(7.9)]	lady's-thumb	spurry, corn

   Banvel Alone (Pasture, Rangeland, Non-crop areas; 2 rates):

Lower rate		
bindweed, field	goldenrod	sow-thistle, perennial
daisy, English	ragwort, tansy	thistle, Canada
Higher rate		
cherry, ground	poverty weed	sorrel, sheep
goat's-beard	sage, pasture	spurge, thyme-leaved
knapweed, diffuse		

Banvel+Roundup (Reduced Tillage):

cereals, volunteer	kochia	oats, wild (8.4)
cockle, cow (8.6)	lady's-thumb	rapeseed, volunteer
flixweed*	lamb's-quarters	stinkweed (9.0)
foxtail, green (8.5)	mustard, wild (8.9)	thistle, Russian (8.0)

* For flixweed, use 400 mL/ac rate of Round-up.

Banvel+2,4-D (Reduced Tillage):

buckwheat	kochia	pigweed, redroot
[tartary,wild]	lady's-thumb	stinkweed
cockle, cow	lamb's-quarters	thistle, Russian
flixweed	mustard, wild	

Banvel+2,4-D (Brush)

alder	poplar, aspen	snowberry, western
cherry	rose, wild	willow, wolf

5. **WEEDS SUPPRESSED:** Control top growth of Canada thistle and perennial sow-thistle and suppresses cleavers at in-crop rates. Top growth control of curled dock at lower pasture rate. Banvel+Roundup suppresses red root pigweed, foxtail barley and wild buckwheat. Banvel+2,4-D on reduced tillage controls top growth of Canada thistle and perennial sow-thistle.

6. **WHEN USED:**

Summerfallow: Banvel alone, perform the final tillage operation the last week of July or the first week of August. Allow thistles to regrow for a minimum of 4 weeks and apply when the majority of thistles have emerged. Apply before thistles reach early bud stage (15-25 cm tall); when field bindweed is flowering. Banvel+Roundup for Canada thistle or perennial sow-thistle only. Tillage and timing practices same as Banvel alone.
Stubble: Banvel alone or Banvel+Roundup. When thistle regrowth is 10-15 cm tall. Apply 2 weeks prior to first killing frost.
Pastures, Rangeland Grasses: When weeds are actively growing or brush species are under 2 m tall.
Reduced Tillage for annual weeds, summerfallow: Banvel+Roundup on actively growing weeds from 8-15 cm tall. Banvel+2,4-D on actively-growing weeds at the 2 to 4-leaf stage.
Cleavers: Spray before 3-whorl stage for better control.

Recommended Leaf Stage or Height of Crop:

Banvel Crop	Banvel Alone	Banvel+2,4-D Amine-500	Banvel+MCPA Amine-500	Banvel+MCPA K-400	Banvel+ Metribuzin
Barley	2-5	2-5	2-5	2-5	2-3
Canary seed	3-5	NR*	3-5	NR	NR
Corn (post emergence)	up to 20 cm	up to 10 cm	NR	NR	NR
Corn (drop nozzles)	20-50 cm	10-50 cm	NR	NR	NR
Fescue (red) seedling	5 cm tall	5 cm tall	NR	NR	NR
Fescue (red) established	up to flag leaf	up to flag leaf	NR	NR	NR
Oats	2-5	NR	2-5	2-5	NR
Rye (spring)	2-3	2-3	NR	NR	NR
Wheat (spring, durum)	2-5	2-5	2-5	2-5	2-3 (spring wheat only)
Wheat (winter)	15-25 cm	15-25 cm	15-25 cm	15-25 cm	NR

* NR-Not Registered

7. **HOW TO APPLY:**

With: Aircraft or Ground equipment.
Rate:
Air: (Banvel or Banvel+phenoxy mixes only). Apply only 95 mL/ac of Banvel by air.
Ground: See table.
Water Volume: Air: 8 L/ac minimum. Ground: Cereals, seed grasses: 45 L/ac. Corn: 90-140 L/ac. Summerfallow/stubble (thistles): 45-90 L/ac. Reduced Tillage: 20-40 L/ac. Pastures, Rangeland Grasses: 45-90 L/ac.
Pressure: Air: not above 200 kPa. Ground: 275 kPa.
Nozzles: Flat fan recommended.

BANVEL 480 g/L FORMULATION

Crop	Banvel Alone mL/ac	Banvel+2,4-D Amine-500 mL/ac+mL/ac	Banvel+MCPA Amine-500 mL/ac+mL/ac	Banvel+MCPA K-400 mL/ac+mL/ac	Banvel+Metribuzin (Sencor or Lexone DF) mL/ac+mL/ac or g/ac
Barley	95	95+340	95+340	95+445	95+110-170 or 110
Canary seed	115	NR*	115+340	NR	NR
Corn (field)	245	115+340	NR	NR	NR
Fescue (red)	245	245+600	NR	NR	NR
Oats	95-115	NR	95-115+340	95-115+445	NR
Rye (spring)	95-115	95-115+340	NR	NR	NR
Wheat (durum, spring)	95-115	95-115+340	95-115+340	95-115+445	95+110-170 or 110
Wheat (winter)	95-115	95-115+340	95-115+340	95-115+445	NR

* NR-Not Registered.

Other Uses	Banvel Alone L/ac	Banvel+2,4-D Amine-500 rate/ac	Banvel+2,4-D L.V. Ester-600 rate/ac	Banvel+Roundup+ Non-ionic surfactent mL/ac+mL/ac+mL/ac
Fallow/stubble; thistles	1.0 L	NR	NR	510+690+142
Reduced tillage	NR	95-115 mL + 445 mL	95-115 mL + 370 mL	115-245+305-400+142
Pastures/range; weeds	0.85-1.9 L	0.85 L+0.90 L	0.85 L+0.75 L	NR
Pastures/range; brush	NR	2.1 L+4.0 L in 1000 L water	2.1 L+3.3 L in 1000 L water	NR

Brush Species	Broadcast Application of Banvel+2,4-D in 90-130 L/ac of water
Aspen poplar	1.3 L/ac+1.7 L/ac 2,4-D Amine-500 **or** 1.5 L/ac 2,4-D Ester-600.
Wild rose	1.5 L/ac+1.7 L/ac 2,4-D Amine-500 **or** 1.5 L/ac 2,4-D Ester-600
Western snowberry	1.5 L/ac+1.5 L/ac 2,4-D Ester-600

8. **APPLICATION TIPS:** Best when crop is under good growing conditions and air temperature 10-25°C. Avoid application when crop is under stress from adverse environmental conditions. Do not spray if risk of frost or severe drop in night temperature is forecast. Do not use on bentgrass. Apply only at recommended crop stage otherwise crop damage can occur.
9. **HOW IT WORKS:** Absorbed through roots and leaves and translocated in phloem and xylem, disrupting the metabolism.
10. **EXPECTED RESULTS:**
    Weeds: Results may take 10-14 days to appear. Proliferation of tissues in plant causes: twisting, bending of stem and leaf petioles; cupping of leaves; increase in root size; increase in fibrous roots.
    Crops: Shortening of straw may occur in treated crops without adverse affects on yield. If applied at other than recommended crop stage, head and stem deformities may occur. Crops under stress from adverse environmental conditions may suffer a further setback. Crop injury may be offset by weed control obtained. **Poor results may be expected if** it rains within 4 hours, older weeds are sprayed, or insufficient water.
11. **EFFECTS OF RAINFALL:** Rainfall more than 4 hours after application will not reduce effectiveness.
12. **MOVEMENT IN SOIL:** Dicamba is more subject to leaching in sandy soils than in clay textured soils. During the growing season the half-life of dicamba is less than 30 days.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Drift: Can harm ornamentals and other desirable plants.
    Grazing Restrictions:
    Canary seed: Use seed only as bird seed.
    Cereals: Follow as per grazing and haying restrictions.
    Corn: Do not graze or harvest for silage until 7 days after Banvel alone or Banvel+2,4-D amine; at least 12 weeks after other tank mixes.
    Pastures, Rangeland, Non-crop area (meat animals): If treated vegetation has been consumed by meat animals within 30 days of Banvel application, feed the animal with untreated diet for 30 days before slaughter. Meat animals may graze or feed on treated pasture 30 days after Banvel application without restrictions on slaughter.
    Grazing and Hay Restrictions (Dairy Cattle): (Days=time between treatment and grazing or cutting.) Up to 500 mL/ac - 0 days, 501-930 mL/ac - 7 days, 931 mL/ac-1.86 L/ac - 14 days, 1.87 - 2.87 L/ac - 30 days.
    Succeeding Crops: When Banvel is applied at 1.0 L/ac on fallow or stubble. Then grow only beans (white), cereals, corn (field, sweet), or soybeans the next year. If application is after September 1 or if soil is dry subsequent to application, crop injury may occur next spring. After Banvel (510 mL/ac) + Roundup (690 mL/ac) for thistle control grow only beans (white), cereals, corn (field, sweet), rapeseed, or soybeans.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = formulated (2629). May cause mild skin irritation and extreme eye irritation and swelling. Non-toxic to fish and birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) to reduce exposure. Can severely damage eyes. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** If frozen, shake thoroughly before use. No activity is lost if completely resuspended.

BASAGRAN (bentazon)

BASF

CAUTION POISON

1. **FORMULATIONS:** Liquid; 480 g/L; 2 X 7 L Basagran + 1 X 7 L Assist Oil Concentrate.
2. **REGISTERED MIXES:** None.
   Surfactants: Assist Oil Concentrate, Citowett Plus.
3. **CROPS:**

alfalfa*	flax (8.8)
alsike clover*	meadow foxtail**
beans [dry (8.1) (black, kidney, pinto, white, lima, snap (8.1))]	orchard grass**
bromegrass**	peas [field (8.5), processing (8.3)]
corn (8.8) (field, seed, silage, sweet)	red clover*
creeping red fescue**	sainfoin*
crested wheatgrass**	soybeans
fababeans (8.6)	timothy**

   Underseeding: Not recommended.
   * Seedling legumes for seed production only.
   ** Seedling grasses for seed production only.
4. **WEEDS CONTROLLED:**

buttercup	groundsel, common (8.5)*	purslane	smartweeds, annual (7.0)
chickweed, common (7.2)	lady's-thumb	radish, wild	spurry, corn (7.0)
cocklebur	lamb's-quarters (6.2)*	ragweed (common, giant)*	stinkweed (7.8)
cudweed, low	mustard, wild (8.4)	rape, bird*	thistle, Russian (7.9)
galinsoga, hairy	nightshade, hairy (6.0)	shepherd's-purse (7.3)	

   * Triazine resistant strains of these weeds are controlled by Basagran.
5. **WEEDS SUPPRESSED:** Bindweed field, redroot pigweed (7.2), thistle, Canada - single application (4.7).
   * Treat field bindweed before it is dark green and has begun to trail.
6. **WHEN USED:**
   Beans (dry, lima, snap): 1-3 trifoliate leaves.
   Corn: 1-5 leaf.
   Fababeans: Soon after 3 leaf stage.
   Flax: Soon after crop reaches 5 cm.
   Peas (field, processing): Soon after 3 pair of leaves form.
   Soybeans: Unifoliate - 2 expanded trifoliate leaves, usually 18-28 day after planting.
7. **HOW TO APPLY:**
   With: Aircraft or Ground equipment
   Rate: 910 mL/ac. For control of cocklebur, lady's-thumb, wild mustard, bird rape, stinkweed and shepherd's-purse 710 mL/ac. Ground: Add 400 mL of Assist Oil Concentrate per 40 litres of water with a maximum rate of 810 mL/ac. Reduce Assist to 400 mL/ac under hot humid conditions. Air: Add 50 - 100 mL/ac Assist Oil Concentrate. Do not use Assist in excess of 100 mL/ac as substantial crop injury could occur.
   Water Volume: Air: 20-40 L/ac. Ground: 80-160 L/ac.
   Pressure: Air: 275 kPa minimum.. Ground: 275-425 kPa.
   Nozzles: Flat fan or hollow cone only recommended. Tilt 45^0 forward to ensure better coverage.
8. **APPLICATION TIPS:** Do not apply to crops that have been stressed (e.g. hail damage, flooding, drought, widely fluctuating temperatures, prolong cold weather). Best results when weeds young and actively growing. Apply Basagran when broadleaf weeds are small and actively growing and before the weeds reach the maximum size recommended for treatment. Basagran should be applied when the main weed of concern is in the suggested growth stage for treatment. **Band Spraying:** Spray minimum of 25 cm wide band. Minimize the amount of dust striking target weeds to ensure adequate coverage and penetration. Do not use cultivation equipment when spraying. Adjust the Basagran rate to proportion of the total area to be sprayed.
9. **HOW IT WORKS:** Contact herbicide which interferes with photosynthesis. In resistant plants, metabolized to a non-toxic material. Uptake into the plant occurs primarily through the leaves. Thorough coverage of foliage is important for consistent weed control.
10. **EXPECTED RESULTS:**
    Weeds: Weeds turn yellow initially and then brown, usually within 2 weeks.
    Crops: Yellowing, bronzing, speckling, or burning occurs sometimes. The crop usually outgrows the condition within 10 days. **Poor results may be expected when** weeds are beyond recommended growth stage; when spray coverage is poor; or under poor growing conditions (cool weather conditions or drought).
11. **EFFECTS OF RAINFALL:** Rainfall within 6-8 hours of application may reduce activity.
12. **MOVEMENT IN SOIL:** Bentazon is not adsorbed to soil particles, but is rapidly incorporated into the soil organic matter by microorganisms. Does not leach below plow layer.

13. **GRAZING AND CROPPING RESTRICTIONS:**
Drift: Avoid drift on to susceptible crops such as adzuki and mung beans, cucumbers, lentils, mustard, rapeseed, sugar beets, sunflowers.
Grazing Restrictions: Do not feed green plants to livestock.
Succeeding Crops: No restrictions.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = technical (1,100). Slightly toxic to fish. Non-toxic to birds and bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). May cause severe damage to eyes. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a heated place, freezing will not affect activity. If frozen, warm to room temperature and shake well.

BETAMIX (phenmedipham + desmedipham), BETANEX (desmedipham)

Nor-Am

1. **FORMULATION:** Emulsifiable Concentrate: Betamix: 75 g/L phenmedipham + 75 g/L desmedipham; 10 L bottle. Betanex: 150 g/L desmedipham; 10 L bottle.
2. **REGISTERED MIXES:** Herbicide 273.
3. **CROPS:** Sugarbeet.
4. **WEEDS CONTROLLED:**

Foxtail (green, yellow)*	Nightshade
Green foxtail	Ragweed
Kochia	Redroot pigweed[2]
Lamb's-quarters	Stinkweed
Mustard	Wild buckwheat

*Betamix only.
[2]Betanex is more effective than Betamix.

5. **WEEDS SUPPRESSED:** None
6. **WHEN USED:** Early post-emergence when weeds are early cotyledon to 4 leaves. Do not commence spray application until mid-afternoon.
7. **HOW TO APPLY:**
With: Ground equipment as a band or broadcast treatment.
Rate: 1.0 to 4.45 L/ac broadcast equivalent in a maximum of 42 litres of water for each litre of Betamix/Betanex. Use low rate on early cotyledon beets and high rate on beets with at least 4 fully expanded leaves. Repeat application for improved weed control.
8. **APPLICATION TIPS:** Avoid spraying until mid-afternoon when day time temperatures will exceed 22°C. High humidity increases efficacy. Best results are obtained with repeat applications of the lowest rate commencing when the first weeds emerge.
9. **HOW IT WORKS:** Absorbed through leaves. Sharply inhibits rate of assimilation of CO_2 in treated plants within 6 hours. Resistant species (sugar beets) begin recovery in this time while susceptible species do not.
10. **EXPECTED RESULTS:** Under warm conditions, weed kill is complete in 4 to 7 days. Cool conditions require longer periods of up to 2 weeks.
11. **EFFECT OF RAINFALL:** Rainfall within 6 hours of application may reduce weed kill.
12. **MOVEMENT IN SOIL:** Very little leaching occurs.
13. **GRAZING AND CROPPING RESTRICTIONS:** None.
14. **TOXICITY:** Acute oral LD $_{50}$ - phenmedipham. (Rat) 8,000 mg/kg. Acute dermal LD $_{50}$ - phenmedipham. (Rat) 4,000 mg/kg. Acute oral LD $_{50}$ desmedipham: (Rat)>10,250 mg/kg. Toxic to fish - avoid contamination of water supply.
15. **PRECAUTIONS AND FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce the skin and eye contact. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Do not store below 0°C.

BLADEX LIQUID, BLADEX NINE-T (cyanazine)

Ciba-Geigy

1. **FORMULATIONS:** Liquid; Bladex Liquid; 480 g/L; 2 X 10 L jugs. Water Dispersible Granules; Bladex Nine-T, 90%, 5x5 kg bags.
2. **REGISTERED MIXES:** Atrazine, Dual Ciba-Geigy 960E, Eradicane, Sutan*.
   Mix Restrictions: Do **not** mix with any oils or adjuvants, other than Bio-Veg crop oil.
3. **CROPS:** Corn [field (8.5) and sweet].
4. **WEEDS CONTROLLED:**

barnyard grass	lady's-thumb	ragweed (common, false)
buckwheat, wild (8.3)	lamb's-quarters (8.5)	shepherd's-purse
foxtail ([green (6.8), yellow]	mustard [wild (8.4), wormseed]	smartweeds, annual
goosefoot, oak-leaved	nightshade, black	stork's-bill
knotweed, prostrate	pigweed, redroot (7.2)	thistle, Russian
kochia	purslane, common	

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Bladex Liquid: May be used pre-plant incorporated on dryland, or pre-emergent followed in 5-7 days with irrigation. Do not use post-emergent.
   Bladex Nine-T: May be used pre-plant incorporated, or early post-emergent with Bio-Veg Crop Oil. (Bio-Veg Crop Oil for post-emergent use only.)
7. **HOW TO APPLY:**
   With: Ground equipment.
   Water Volume: 60-80 L/ac.
   Pressure: 200-300 kPa.
   Rate:

Time	Bladex Liquid (L/ac)	Bladex Nine-T (kg/ac)
Pre-plant	1.7-2.0	0.9-1.1
Pre-emergent (only with irrigation)	1.9-2.3	1.0-1.2
Early post-emergent	NR*	1.0

   Use lower rates for light textured soils and higher rates for heavier soils.
   *NR-Not Registered.
8. **APPLICATION TIPS:** Do not use Bladex on soils with more than 70% sand or less than 1% organic matter. For early post-emergent application: add 1 L Bio-Veg crop oil/100 L spray solution. Do not apply beyond the 3 leaf stage of corn (approx. 7.5 cm). A timely inter-row cultivation will control any seedling weeds which escape the treatment. If crop is under stress from cold, wet conditions, injury may occur. Do not apply Bladex if these conditions are expected within a 7 day period after application.
9. **HOW IT WORKS:** Active through root uptake, requires moisture to carry it to root zone. Interferes with photosynthesis.
10. **EXPECTED RESULTS:** Weeds fail to emerge or die before reaching 2-3 leaf stage.
11. **EFFECTS OF RAINFALL:** Rainfall or irrigation required for activation. Heavy rainfall on very sandy soil may cause leaching and reduce effectiveness.
12. **MOVEMENT IN SOIL:** Degree of movement depends on soil texture, water content, and organic matter. In most cases, movement is negligible. On sandy soils, leaching rate was found to be comparable to atrazine.
13. **GRAZING AND CROPPING RESTRICTIONS:** Where atrazine mix is used, corn should follow corn.
14. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (182-380), Bladex Liquid (149-334), Bladex 80W (221-394). Low toxicity to fish and birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** get medical attention.
16. **STORAGE:** Not damaged by freezing. Store in a dry place.

BLADEX LIQUID (cyanazine)

For Triazine Tolerant Canola Only

Ciba-Geigy

1. **FORMULATIONS:** Liquid; 480 g/L; 2 X 10 L jugs.
2. **REGISTERED MIXES:** Fusilade, Lontrel, Poast. Follow label for mixing instructions.
   Mix Restrictions: Add 1/2 the required amount of water, start agitation, add Bladex TTC, add more water, then Fusilade, Lontrel or Poast then Assist oil concentrate, then remaining water.

3. **CROPS:** Triazine tolerant canola (varieties: Tribute, Triton, Triumph). **Non-triazine tolerant canola will be killed.**
4. **WEEDS CONTROLLED:**

buckwheat, wild	lady's-thumb	rapeseed (volunteer
chickweed	lamb's-quarters	non-triazine tolerant)
cleavers	mustard, wild	shepherd's-purse
flax (volunteer)	pigweed, redroot*	smartweeds, annual
groundsel, common		stinkweed (8.5)
hemp-nettle (8.9)		

*Apply when redroot pigweed is small (less than 5.0 cm in height).

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** When crop and weeds are in 1-4 leaf stage.
7. **HOW TO APPLY:**
With: Ground equipment.
Rate: Bladex Liquid: 1.2 L/ac. Bladex Liquid: 1.2 L/ac + Fusilade: 200-400 mL/ac. Bladex Liquid: 1.2 L/ac + Lontrel: 0.3-0.6 L/ac. Bladex Liquid: 1.2 L/ac + Poast: 325-770 mL/ac.
Water Volume: 40 L/ac.
Pressure: 275 kPa.
Nozzles: Flat fan recommended. Screens 50 mesh or larger.
8. **APPLICATION TIPS:** Optimum weed control is achieved when weeds are small and actively growing; later applications will be less effective.
9. **HOW IT WORKS:** Inhibits photosynthesis.
10. **EXPECTED RESULTS:** Weeds fail to emerge or die before 2-3 leaf stage.
11. **EFFECTS OF RAINFALL:** Rainfall within 2 hours of application may reduce effectiveness.
12. **MOVEMENT IN SOIL:** Degree of movement depends on soil texture, water content, and organic matter. In most cases, movement is negligible. On sandy soils, leaching rate was found to be comparable to atrazine.
13. **GRAZING AND CROPPING RESTRICTIONS:** No cropping restrictions.
14. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (182-380), Bladex Liquid (149-334). Low toxicity to fish and birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Not damaged by freezing. Store in a dry place.

BLAGAL (cyanazine + MCPA-K)

DuPont

DANGER POISON

1. **FORMULATIONS:** Liquid; 125 g/L of cyanazine + 250 g/L MCPA-K; 2 X 10 L jugs.
2. **REGISTERED MIXES:** None.
Mixing Instructions: Vigorous agitation is necessary if the solution stands for several hours before spraying.
3. **CROPS:** Barley (8.5), oats (9.0), wheat [spring (8.7)].
Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**

buckwheat [tartary (8.2), wild (7.2)]	lamb's-quarters (8.7)	spurry, corn
chickweed (7.6)	mustard (ball, tumble, wild, wormseed)(8.7)	stinkweed (8.7)
hemp-nettle (7.9)	radish, wild	MCPA-K susceptible weeds
lady's-thumb	smartweeds, annual	

5. **WEEDS SUPPRESSED:** Canada thistle, horsetail.
6. **WHEN USED:** Cereals, 2-5 leaf stage. Canada thistle, delay application until cereals have reached 5 leaf stage.
7. **HOW TO APPLY:**
With: Ground equipment.
Pressure: 200-300 kPa.
Nozzles: Flat fan recommended. Screens 50 mesh or larger.
8. **APPLICATION TIPS:** Boom Angle: Direct spray straight down.
Application after 5 leaf stage may cause serious crop injury and give poor weed control.
Allow 4 days before or after wild oat herbicide application.
9. **HOW IT WORKS:** Cyanazine and MCPA-K act synergistically to disrupt metabolism and inhibit photosynthesis.

10. **EXPECTED RESULTS:**
Weeds: Yellow blotches first appear in 5-10 days then the whole plant turns yellow and brown and dies. Young vigorously growing plants affected first.
Crop: Under moisture or temperature stress, Blagal may cause temporary yellowing of lower leaves. **Poor results may be expected if** reduced application rate. Poor penetration through dense crop canopy. Extremely poor growing conditions (droughty). Late application.
11. **EFFECTS OF RAINFALL:** Rain within 4 hours will seriously reduce activity.
12. **MOVEMENT IN SOIL:**
Cyanazine: Degree of movement depends on soil texture, water content, and organic matter. In most cases, movement is negligible. On sandy soils, leaching rate was found to be comparable to atrazine.
MCPA-K: Readily mobile in the soil.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or feed green plants to livestock.
Crop Use After Hail: Use if mature.
Succeeding Crops: No restrictions.
Rate: 910 mL/ac.
Water Volume: 40 L/ac minimum.
14. **TOXICITY:** Moderate-high acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = Cyanazine (182-380), MCPA (700), Blagal (500). Non-toxic to fish, birds, and bees.
15. **PRECAUTIONS, FIRST AID:** May cause burns upon contact with skin and it can be absorbed through the skin. Wear standard protective clothing (see page xx) to avoid contact with skin or eyes. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Not damaged by freezing. Store in dry area and shake well before use. To re-suspend, warm and agitate.

BUCTRIL M (bromoxynil + MCPA)

Rhône - Poulenc

WARNING POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 280 g/L bromoxynil + 280 g/L MCPA; 8 L jugs.
2. **REGISTERED MIXES:** Atrazine (corn), Avenge (barley, Avenge wheat varieties), Glean [barley, wheat (spring)], MCPA (amine, ester, K salt)(barley, oats, wheat), Poast+Assist (flax), TCA (barley, oats).
Mix Restrictions: Atrazine: add Atrazine (450-910 g active/ac) to tank first. Do not add oil or surfactant. Observe precautions and limitations of both labels. TCA: Prepare Buctril M mix, then add TCA. Avenge: add 1/2 of the water, add Buctril M, add rest of water, add Avenge. Glean: ensure Glean is completely suspended before adding Buctril M; no surfactant needed. MCPA: add 1/2 of the water, add MCPA, agitate, add rest of water, add Buctril M.
3. **CROPS:**

barley (8.8)
canary seed (8.5)
corn (field, sweet)(9.0)
Seedling Grasses (for seed)
bromegrass (8.9)
canary grass, reed
fescue [creeping red (8.7), meadow (8.3)]
flax (8.4)
oats (8.8)
rye, fall
orchard grass (8.9)
ryegrass, Russian wild (9.0)
timothy (8.5)
wheat [durum, spring (8.6)]
wheat, winter (8.8) (fall or spring applied)
wheatgrass (8.5)(crested, intermediate, slender, tall)

Underseeding: Not recommended.

4. **WEEDS CONTROLLED:**

bluebur
buckwheat [tartary (8.5), common, wild (8.1)]
catchfly, night-flowering (7.8)
chamomile, scentless (7.2)
cockle, cow (7.8)
cocklebur
flixweed (5.7)
groundsel, common
kochia (6.7)
lady's-thumb
lamb's-quarters (8.6)
mustard
[ball, wild (8.4), wormseed]
nightshade, American
pigweed, redroot (7.9) (except flax)
ragweed, common
rapeseed, volunteer (8.7)
shepherd's-purse (6.0)
smartweeds, [green, pale (8.2)]
stinkweed (8.9)
sunflower, volunteer
thistle, Russian (7.1)

5. **WEEDS SUPPRESSED:** Canada thistle (4.9) and perennial sow-thistle.
6. **WHEN USED:**
Cereals: 2 leaf to early flag leaf.
Winter wheat, fall rye: 2-4 leaf (fall): after growth begins to early flag leaf (spring).
Canary seed: 3-5 leaf.
Flax: 5-10 cm.
Corn: 4-6 leaf.
Seedling Grasses: 2-4 leaf (establishment year only, not underseeded to legumes).
Weeds: before 5 leaf stage. Buckwheats, groundsel, lamb's-quarters, mustards (wild, wormseed), ragweed, stinkweed - up to 8 leaf stage.

7. **HOW TO APPLY:**
With: Aircraft (wheat, barley and oats only) or Ground equipment.
Rate: 400 mL/ac.
Water Volume: Air: 8 L/ac or more. Ground: 20 L/ac or more. Corn: 80-120 L/ac. Seedling Grasses: 60 L/ac.
Pressure: 275 kPa.
Nozzles: Flat fan recommended. Hollow cone (air only).
8. **APPLICATION TIPS:** Avoid spraying during a severe drought. Under conditions of high temperature and humidity, slight discolouration of cereals may occur but no effect on crop yields. Flax is less tolerant than cereals, therefore do not spray flax in hot humid weather when day time temperatures are over 25-29°C. Best results are achieved when weeds are sprayed in seedling stage, with good spray coverage. Corn: Buctril M at 400 mL/ac, as an overall spray only up to 6 leaf stage. Buctril M+Atrazine for a broader spectrum of weed control. Cultivation after application is not recommended. Observe all Glean precautions (with Glean mix), including soil pH limits and crop rotations.
9. **HOW IT WORKS:** Bromoxynil is a contact type herbicide, therefore, good spray coverage is essential. Inhibits photosynthesis and plant respiration. MCPA is absorbed through leaves and is readily translocated in the plant.
10. **EXPECTED RESULTS:** Small burnt spots on the leaf can appear within hours, death takes up to 2 weeks. **Poor results may be expected if** poor coverage. Poor penetration through crop canopy.
11. **EFFECTS OF RAINFALL:** No effect.
12. **MOVEMENT IN SOIL:** Readily leached from soil. Longer residual in dry soil.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for greenfeed until 56 days after treatment.
Succeeding Crops: No restrictions.
14. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (365). Very toxic to fish and birds. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** May cause burns and may be absorbed through the skin. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake of a large dose can cause sudden collapse and coma.
16. **STORAGE:** Does not require heated storage.

CALMIX PELLETS/HYBOR-D (bromacil + 2, 4-D)

Rhône - Poulenc/United Agri Products

1. **FORMULATIONS:** Calmix Pellets; 3.0% bromacil + 5% 2,4-D; 1 kg, 5 kg bags. Hybor-D granular; 2.0% bromacil + 5% 2,4-D; 5 kg Shaker boxes.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Non-crop areas only.
4. **WEEDS CONTROLLED:** Non-selective.
5. **WEEDS SUPPRESSED:** Not applicable.
6. **WHEN USED:** May be applied during the growing season, but to prevent growth apply in fall or early spring.
7. **HOW TO APPLY:**
With: Calmix spreader or shaker, or Hybor-D shaker box.
Rate: Apply higher rate to heavier soils and/or to extend the growth control period.

Weeds	Calmix Pellets kg/100 m^2	Hybor-D kg/100 m^2
Annual weeds and perennial seedlings	2.5	5.0
Shallow-rooted perennials	3.75	—
Heavy perennial growth	5.0	7.5

Spot treatment Calmix: 37.5 g to about 1 m^2. Repeat treatment when required.
Around utility poles, treat 1.25 m around each pole, 250 g Calmix/pole.
Spot treatment Hybor: 63 g to about 1 m^2.

8. **APPLICATION TIPS:** Do not use near lawns or flower beds. Do not apply closer than 1.5 times the height of nearby trees. Do not apply on slopes where water erosion may carry chemical onto areas of desirable vegetation. Do not contaminate water used for irrigation or other domestic uses.
9. **HOW IT WORKS:** Systemic action, enters plant via roots.
10. **EXPECTED RESULTS:** Vegetation turns brown and dies. No new growth will appear, resulting in bare ground. Rapidity and duration of control will depend upon amount of chemical applied, soil type and environmental conditions. **Poor results may be expected if** inadequate application rate. Soil erosion removes chemical from treated area when applied on slopes. Insufficient rainfall to activate chemical.
11. **EFFECTS OF RAINFALL:** Moisture will activate and carry the herbicide into the root zone.

12. **MOVEMENT IN SOIL:** Once fixed in the soil there is very little lateral movement. Pellets and granular can be carried by erosion.
13. **GRAZING AND CROPPING RESTRICTIONS:** Use on non-crop areas only.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = bromacil (5,200); 2,4-D (375). Slightly toxic to fish. Non-toxic to birds.
15. **PRECAUTIONS, FIRST AID:** May cause burns and may be absorbed through the skin. Wear standard protective clothing (see page xx) to avoid exposure to dust. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in dry area.

CASORON (dichlobenil)

United Agri Products

1. **FORMULATIONS:** Granular; 4%; 2.25 kg shaker jug, 15 kg bag.
2. **REGISTERED MIXES:** None.
3. **CROPS:**

arbor vitae	cedar, white	juniper	non-crop areas
ash	crabapple	linden	raspberries
birch, cutleaf weeping	fruit trees, established*	maple	willow
caragana shelterbelts	honeysuckle		

* Apple, cherry, peach, pear, plum at least 1 year old.

4. **WEEDS CONTROLLED:**

artemisia	groundsel	mustard	shepherd's-purse
bindweed	horsetail	pigweed	smartweeds
bluegrass, annual	knotweed	purslane	spurge
chickweed	lamb's-quarters	quackgrass	thistle, Canada
foxtail			

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** For best results apply when soil temperatures are cool.
   Annual Weeds: Apply to prepared weed-free soil either in early spring before seeds of annuals germinate or after cultivation has removed weeds. Do not apply until 4 weeks after transplanting tolerant crops.
   Perennial Weeds: Apply in fall (October 15 until soil freeze-up) on crops established for at least 1 year. Quackgrass, artemisia in established woody ornamentals apply in fall and again in the early spring before May 1.
   Raspberries: Apply in late fall but before soil freeze-up. Do not cultivate or work into the soil. Do not apply in spring as injury may occur.
7. **HOW TO APPLY:**
   With: Ground granular applicator.
   Rate:
   Annual weeds: 45-70 kg/ac, based on area actually treated.
   Quackgrass, artemisia in woody ornamentals: 60 kg/ac in fall; 60 kg/ac again in spring.
   Quackgrass, thistles, bindweed in woody ornamentals: 91-111 kg/ac.
   Raspberries: 71 kg/ac.
8. **APPLICATION TIPS:** Do not use on light sandy soils with less than 2% organic matter. Do not use on firs, hemlock, lilac, spruce, Mugho pine nor on herbaceous perennials. Do not use in seed beds, transplant, or cutting beds or in greenhouses. Do not apply until 6 months after rooting of cuttings in the field.
9. **HOW IT WORKS:** Snow melt or rain moves Casoron into the soil. Casoron inhibits germination but acts primarily on growing points and root tips.
10. **EXPECTED RESULTS:** Growth of emerging shoots of some perennials controlled. Tolerant crops are unaffected if roots do not come in contact with Casoron in the upper layers of the soil.
11. **EFFECTS OF RAINFALL:** If it is dry, poor results can be expected.
12. **MOVEMENT IN SOIL:** Some movement in coarse-textured soils.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not transplant into treated soil for 1 year. Do not plant vegetables or other sensitive crops the year following treatment. Do not graze livestock in treated areas.
14. **TOXICITY:** Very low mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (3,160). Slightly toxic to fish.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) to avoid skin and eye contact. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Dry storage - not affected by frost.

DESORMONE LV700/DIPHENOPROP 700
(2, 4-D + dichlorprop)

Rhône - Poulenc/United Agri Products

1. **FORMULATIONS:** Emulsifiable Concentrate; 330 g/L 2,4-D + 350 g/L dichlorprop; 4 L, 10 L, 20 L containers.
2. **REGISTERED MIXES:** DyCleer.
   Mix Instructions: Add 1/2 amount of carrier, start agitation, add herbicide, add rest of carrier. If used in oil, do not let water get in mixture.
3. **CROPS:** Non-crop areas, industrial areas, rights of way, roadsides.
   Underseeding: Not applicable.
4. **WEEDS CONTROLLED:**

Brush			
alder	cedar, white	hazel	plum, wild
apple, wild	cherry, wild	hickory	poison-ivy
aspen	elderberry	honeysuckle	poplar
basswood	elm	juniper, ground	raspberry (tame, wild)
birch	fir, balsam	maple (Manitoba, silver)	sumac
blueberry	hardhack	oak (bur, white)	tamarac
buckbrush	hawthorn	pine (red, Scotch)	willow
Weeds			
alfalfa	clover, sweet	hawkweed	teasel
burdock	dandelion	horsetail	thistle (bull, Canada)
buttercup	dock, curled	mullein	vetch
carrot, wild	dogbane	plantain	yellow rocket
chicory	goat's-beard	sow-thistle, perennial	most annual broadleaf weeds
cinquefoil	goldenrod	tansy	

5. **WEEDS SUPPRESSED:** Milkweed, rose, sugar maple, toadflax.
6. **WHEN USED:** Throughout growing season.
7. **HOW TO APPLY:**
   With: Aircraft, power equipment, knapsack sprayer.
   Rate: Brush: 7.0-11.0 L in 1000 L of water for foliage stem treatment. Weeds: 1.42-2.02 L/ac.
   Water Volume: Spray to point of runoff. For fixed wing application - 8 L/ac minimum. Water may be replaced by oil.
   Pressure: As recommended for equipment used.
8. **APPLICATION TIPS:** Forms an emulsion in water - agitate to prevent separation.
9. **HOW IT WORKS:** A translocated, systemic herbicide absorbed by leaves.
10. **EXPECTED RESULTS:** Leaves brown and wilt shortly after spraying - no leaves appear the following year.
11. **EFFECTS OF RAINFALL:** Rain within 3 or 4 hours after application may reduce control.
12. **MOVEMENT IN SOIL:** Leaching does not pose a problem.
13. **GRAZING AND CROPPING RESTRICTIONS:** No grazing restrictions specified.
    Drift: Over susceptible crops causes injury.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = 2,4-D (300-1000); dichlorprop (800). Toxic to bees.
15. **PRECAUTIONS, FIRST AID:** May cause burns and may be absorbed through the skin. Do not apply when bees are foraging. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed seek** medical attention.
16. **STORAGE:** If frozen, warm to 5°C and mix well.
    Note: Similar products are Estaprop/Diphenoprop 600.

DUAL (metolachlor)

Ciba-Geigy

1. **FORMULATIONS:** Emulsifiable Concentrate; 960 g/L; 2 X 10 L jugs.
2. **REGISTERED MIXES:** May be applied as split application or tank mixed as follows. With Aatrex Liquid, Aatrex Nine-O, Bladex formulations, or Banvel, Kil-Mor and Estemine 2,4-D: split application only. Liquid nitrogen - 28% nitrogen solutions or complete liquid fertilizers may replace all or part of the water for pre-plant incorporated or pre-emergent application of Dual tank mixes in corn. Dry Bulk Granular Fertilizers - impregnate on fertilizer, soil apply, then incorporate to 5 cm.

Mix Restrictions: Do not tank mix with Kil-mor or Estemine 2,4-D. Do not impregnate on nitrate fertilizers (ammonium, potassium, sodium, calcium) or on single superphosphate (0-26-0), triple superphosphate (0-46-0) or on ammonium phosphate or on limestone. Fertilizer blends containing limestone may be impregnated.

3. **CROPS:** Beans (snap), corn (all types), potatoes (except Superior), soybeans, sugar beets.
4. **WEEDS CONTROLLED:** Barnyard grass, green and yellow foxtail plus weeds controlled by the second material in mix or oversprayed.
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Corn: Pre-plant incorporated, pre-emergent (under irrigation only).
   Potatoes (except Superior): Pre-plant, pre-emergent.
   Soybeans: Pre-plant, pre-emergent.
   Sugar beets: Pre-plant, pre-emergent.
7. **HOW TO APPLY:**
   With: Ground equipment: band or overall spray.
   Water Volume: 70-140 L/ac.
   Incorporation: Incorporate to 5 cm. Do not exceed this depth since product dilution can occur. If using tandem discs set to cut to a depth of 10 cm operated at 6-9 km/h. If using vibrating shank cultivators with overlapping sweeps, set 10 cm deep and operate at 10-13 km/h. Spike tooth or diamond tooth harrows are good incorporation equipment. Immediate incorporation is not necessary although desirable.
   Pressure: 200-300 kPa.
   Rate: Corn, potatoes, sugar beets: 0.8-1.1 L/ac. Snap beans, soybeans: 0.7-1.1 L/ac.
   Corn: Tank mixes of Dual Ciba-Geigy 960E at above rate plus:

	Tank Mixes for Corn (Qty/ac)	Split Application	
Weeds Controlled	**Pre-plant**	**Pre-emergent (under irrigation only)**	**Post-emergent**
Annual grasses and broadleaf weeds	Aatrex Nine-0 - 0.5-0.7 kg/ac **or** Aatrex Liquid - 0.9-1.3 L/ac **or** Bladex Liquid - 1.5-1.9 L/ac **or** Bladex Nine-T - 0.9 kg/ac	Aatrex Nine-0 - 0.5-0.7 kg/ac **or** Aatrex Liquid - 0.9-1.3 L/ac **or** Bladex Liquid - 1.7-2.0 L/ac **or** Bladex Nine-T - 1.1 kg/ac	Kilmor - 345-445 mL/ac **or** Estemine 2,4-D - 285-445 mL/ac

8. **APPLICATION TIPS:** For band treatments, use a press wheel ahead of the nozzle to level the band.
9. **HOW IT WORKS:** Inhibits germination, particularly grasses.
10. **EXPECTED RESULTS:** Annual grasses do not germinate or under dry conditions may die back soon after emergence.
11. **EFFECTS OF RAINFALL:** Moisture required to move chemical to area of germination but an excess may move it below this area.
12. **MOVEMENT IN SOIL:** Some movement may occur if excess moisture or light soil.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not apply on muck, peat or high organic soils, or after growth has begun. Winter cereals may be seeded 4.5 months after treatment.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (2,780), Dual Ciba-Geigy (2,690). Prolonged exposure may cause eye injury. Slightly toxic to birds; non-toxic to fish.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Heated storage required.

DYCLEER (dicamba)

Sandoz Agro

1. **FORMULATIONS:** Liquid; 480 g/L; 9.5 L jug. **Rates only for the 480 g/L formulation.**
2. **REGISTERED MIXES:** 2,4-D (Amine, LV Ester); 2,4-D+dichlorprop (Desormone LV 700, Diphenoprop 700).
   Mix Restrictions: Do not mix with oils. Use aerial tank mixes only on: aspen poplar, red pine, white birch, willow.
3. **CROPS:** Non-crop areas, turf (established).

4. **WEEDS CONTROLLED:**

Weeds

0.50 L/ac DyCleer (Turf)	0.95 L/ac DyCleer	1.90 L/ac DyCleer	3.7 L/ac DyCleer
chickweed, mouse-eared	bindweed, field	cherry, ground	beby's breath
clover	daisy, English	goat's-beard	lambkill
knotweed, erect	goldenrod	knapweed, diffuse	sage brush, fringed
sorrel, sheep	ragweeds (common, false, giant)	poverty weed	
0.85 L/ac DyCleer +	ragwort, tansy	sage, pasture	
1.6 L/ac 2,4-D Amine 500	sow-thistle, perennial	sorrel, sheep	
wild carrot	thistle, Canada	spurge, thyme-leaved	

Brush: Rates /1000 L of water

Group 1: 2.1 L DyCleer+(4.0 L 2,4-D Amine or 3.3 L 2,4-D Ester 600)

alder	poplar, aspen	rose, wild	snowberry, western	willow, wol

Group 2: 4.0 L DyCleer+(8.0 L 2,4-D Amine or 6.6 L 2,4-D Ester 600)

basswood	birch	cottonwood, black	elm	fir, bclsam
oak (bur, red)	pine	poplar, balsam	spruce	tamarack

Group 3: 5.2 L DyCleer+7.1 L (2,4-D+dichlorprop)

ash, white	maple, sugar

5. **WEEDS SUPPRESSED:** Top growth control.

0.50 L/ac DyCleer		0.95 L/ac DyCleer	3.7 L/ac DyCleer
absinthe	sow-thistle, perennial	curled dock	cinquefoil, perennial
chamomile, scentless	spurge, leafy		knapweed, Russian
poverty weed	thistle, Canada		

6. **WHEN USED:**
Coniferous and Deciduous species: When leaves are fully expanded (spring-early summer) and stop applications at least 3 weeks prior to a change of leaf colour in the fall.
Broadleaf weeds: When actively growing, normally between May and July.

7. **HOW TO APPLY:**
With: Aircraft or Ground equipment. Thorough coverage essential.
Rate: See Weeds Controlled, Weeds Suppressed. Rates vary depending on species.
Water Volume: Aircraft: 35 L/ac minimum. Ground: Turf weeds: 45 L/ac; Weeds: 45-90 L/ac; Brush: rate/1000 L of water.

8. **APPLICATION TIPS:** Thorough coverage of weed and wetting brush to the point of runoff is essential for control. Brush and trees over 2 m should be cut and regrowth sprayed. Do not use on bentgrass. Do not rake, mow, or water turf within 24 hours after treatment. 2,4-D Ester tank mix may improve brush control, especially under drought stress. Tank mix with 2,4-D (Amine or Ester) for control of a broader range of weeds. Avoid spraying if temperatures exceed 30°C to reduce risk of vapour drift. Avoid spraying onto soil over root system of desirable trees and shrubs. Thoroughly clean application equipment after use.

9. **HOW IT WORKS:** Dicamba is a systemic herbicide that is absorbed through roots or leaves and translocated in most plants. Disrupts the metabolic and growth activities in the plant.

10. **EXPECTED RESULTS:** Excellent control of brush can be expected within a year of application. Effect on broadleaf weeds may be seen in 10-14 days with twisting and bending of main stem, cupping of leaves, increase in root size and increase in fibrous roots.

11. **EFFECTS OF RAINFALL:** Rainfall 4 hours after application will not reduce effectiveness.

12. **MOVEMENT IN SOIL:** Dicamba is more subject to leaching in sandy soils than in clay textured soils. During the growing season the half-life of dicamba is less than 30 days.

13. **GRAZING AND CROPPING RESTRICTIONS:** Use on non-crop areas only.

14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = dicamba DMA salt (2,600). Low toxicity to fish. Non-toxic to bees.

15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) to reduce exposure. May cause severe damage to eyes. **If in eyes or on skin use** standard first aid measures (see page xxiii). **If swallowed** seek medical attention.

16. **STORAGE:** Freezing may cause crystalization but no activity is lost if completely resuspended.

DYCLEER 24 (dicamba + 2, 4-D amine)

Sandoz Agro

WARNING POISON

1. **FORMULATIONS:** Liquid; 200 g/L dicamba + 400 g/L 2,4-D amine: 10 L jug.

2. **REGISTERED MIXES:** None.
Mix Restrictions: Do not mix with oils.

3. **CROPS:** Non-crop areas, turf (established).

4. WEEDS CONTROLLED:

Weeds

1.1 L/ac (Turf)	2.2 L/ac	4.5 L/ac
chickweed, mouse-eared	carrot, wild	cherry, ground
clover	daisy, English	goat's-beard
dandelion	goldenrod	knapweed, diffuse
knotweed, striate	ragweeds (common, false, giant)	poverty weed
plantain	ragwort, tansy	sage, pasture
sorrel, sheep		sorrel, sheep
		spurge, thyme-leaved

Brush 5.0 L/1000 L Water	10.0 L/1000 L Water	
alder	basswood	oak (bur, red)
poplar, aspen	birch	pine
rose, wild	cedar (red, white)	poplar, balsam
snowberry, western	cottonwood, black	spruce (red, white)
willow, woll	elm	tamarack
	fir, balsam	

5. WEEDS SUPPRESSED: Top growth control. *Apply to regrowth in summer and fall.

1.1 L/ac		2.2 L/ac
absinthe	sow-thistle, perennial	bindweed, field*
chamomile, scentless	spurge, leafy	sow-thistle, perennial*
poverty weed	thistle, Canada (6.3)	thistle, Canada*
		dock, curled

6. WHEN USED:
Coniferous and Deciduous species: When leaves are fully expanded (spring-early summer) and stop applications at least 3 weeks prior to a change of leaf colour in the fall.
Broadleaf weeds: When actively growing, normally between May and July.

7. HOW TO APPLY:
With: Conventional boom sprayer, handgun, or boomless type sprayer. Thorough coverage essential.
Rate: See Weeds Controlled, Weeds Suppressed. Rates vary depending on species.
Water Volume: Turf Weeds: 45 L/ac. Broadleaf weeds: 45-90 L/ac. Brush: rate/1000 L of water, applied to runoff.

8. APPLICATION TIPS: Thorough coverage of weed and wetting brush to the point of runoff is essential for control. Brush and trees over 2 m should be cut and regrowth sprayed. Do not use on bentgrass. Do not rake, mow, or water turf within 24 hours after treatment. Avoid applications if temperatures exceed 30°C to reduce risk of vapour drift. Avoid applications onto soil over the root systems of desirable trees and shrubs. Thoroughly clean application equipment after use.

9. HOW IT WORKS: Dicamba is a systemic herbicide that is absorbed through roots or leaves and translocated in most plant Disrupts the metabolic and growth activities in the plant.

10. EXPECTED RESULTS: Excellent control of brush can be expected within a year of application. Effect on broadleaf weeds seen in 10-14 days resulting in twisting and bending of the main stem, cupping of leaves, increase in root size and stimulation of fibrous root production.

11. EFFECTS OF RAINFALL: Rainfall 4 hours after application will not reduce effectiveness.

12. MOVEMENT IN SOIL: Dicamba: more subject to leaching in sandy soils than in clay textured soils. During the growing season the half-life of dicamba is less than 30 days. 2,4-D: Leaching does not pose a problem.

13. GRAZING AND CROPPING RESTRICTIONS: Use on non-crop areas only.

14. TOXICITY: Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = formulation (2,500). Low toxicity to fish. Non-toxic to bees.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page xx) to reduce exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.

16. STORAGE: Freezing may cause crystalization but no activity is lost if completely resuspended.

DYVEL (dicamba + MCPA-K)

Sandoz Agro

1. FORMULATIONS: Water Soluble Solution; 84 g/L dicamba + 336 g/L MCPA-K; 10 L jug.

2. REGISTERED MIXES: None.

3. CROPS: Barley (8.1), oats (9.0), wheat [spring (8.7), winter].
Underseeding: Legume underseeding not recommended.

4. **WEEDS CONTROLLED:**

buckwheat	kochia (7.9)	pigweed [prostrate, redroot	smartweeds, annual (7.7)
[tartary (7.6), wild (7.1)]	lady's-thumb	(7.2), Russian]	spurry, corn (5.6)
burdock	lamb's-quarters (8.0)	radish, wild	stinkweed (8.4)
cockle, cow	mustard (8.8)(ball,	ragweeds (common, false, giant)	sunflower, volunteer
cocklebur	hare's ear, Indian, tumble,	shepherd's-purse	thistle, Russian (7.0)
flixweed	wild (8.4), wormseed)		
hemp-nettle (6.5)			

5. **WEEDS SUPPRESSED:** Canada thistle (7.3), sow-thistle, cleavers.
6. **WHEN USED:**
   Barley, oats, spring wheat: 2-5 leaf stage.
   Winter wheat: apply in spring when wheat is 15-25 cm tall or before shot blade stage. Best results will be obtained on hemp-nettle and cow cockle if application is made at the 2-3 leaf stage and at the 2-3 whorl stage of corn spurry.
7. **HOW TO APPLY:**
   With: Aircraft or Ground equipment.
   Rate: 500 mL/ac.
   Water Volume: Air: 8 L/ac minimum. Ground: 45 L/ac.
   Pressure: Air: not above 200 kPa. Ground: 275 kPa.
8. **APPLICATION TIPS:** Best under good growing conditions and air temperature 10-25°C. Avoid application when crop is under stress from disease or adverse environmental conditions. Do not spray if rain is expected within 4 hours of application. Avoid application if frost or severe drop in night temperature is forecast. To prevent drift to sensitive crops, do not spray if temperatures are expected to exceed 30°C, when humidity is high, or fog is present. Crop damage can occur if the chemical is applied at any time other than the recommended crop stage. Shortening of straw may occur without loss in yield.
9. **HOW IT WORKS:** DyVel is a systemic herbicide that is absorbed through the roots and leaves and translocated readily.
10. **EXPECTED RESULTS:**
    Weeds: Twisting, bending of main stem and leaf petioles, cupping of leaves or increase in root size occur within 10-14 days. **Poor results may be expected if** it rains within 4 hours of application, or when older weeds are sprayed, or if less than recommended water volume is used.
11. **EFFECTS OF RAINFALL:** Rainfall 4 hours after application will not reduce effectiveness.
12. **MOVEMENT IN SOIL:** At recommended rates, very little movement occurs.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for livestock feed prior to crop maturity.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = dicamba (1,707-2,900), MCPA (700). Non-toxic to birds, fish, and bees.
15. **PRECAUTIONS, FIRST AID:** May cause burns and can be absorbed through the skin. Wear standard protective clothing (see page xx) to cut down on exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). May cause some swelling to eyes. **If swallowed** seek medical attention.
16. **STORAGE:** Protect from freezing but if frozen no activity is lost if completely resuspended.

2, 4-D (amine, LV esters)

Numerous Manufacturers

WARNING POISON

1. **FORMULATIONS:** Liquids: Amines, LV esters.
   Amine 500: Amsol; 2,4-D Amine (500, 80); Estemine 2,4-D; Dy-Amine; No-Weed 2,4-D. 470 g/L. 4 L, 2 X 10 L, 20 L containers.
   LV Ester 500: SEE - 2,4-D; 450 g/L; 2 X 10 L pack.
   LV Ester 600: 2,4-D LV Ester (600, 96); No-Weed 2,4-D; 564 g/L; 2 X 10 L pack.
   LV Ester 700: 2,4-D LV Ester 700; 700 g/L; 20 L pails.
2. **REGISTERED MIXES:**
   2,4-D Amine: Atrazine (non-crop areas); atrazine+dicamba+mecoprop (corn); bromoxynil (barley, wheat); dicamba [barley, corn, non-crop areas, pastures, rangeland, red fescue (for seed only), rye (spring), turf, wheat (spring, winter)]; dicamba+mecoprop (barley, wheat); mecoprop (turf); propanil [wheat (durum, spring)]; Sencor (barley, wheat); sodium TCA (barley, brush, flax); Glean (barley, wheat).
   2,4-D Ester: Bromoxynil (barley, wheat); dicamba (non-crop areas, pastures, rangeland); dicamba+dichlorprop (non-crop areas, rangeland); dichlorprop (barley, non-crop areas, turf, wheat); difenzoquat (barley, Avenge wheat varieties); propanil [wheat (durum, spring)]; sodium TCA (brush), Glean (barley, wheat).
   Note: Some formulations can be mixed with liquid fertilizer (28-0-0).

3. CROPS:

asparagus	flax (emergency only)*	oats (emergency only)*	rye (fall, spring) (8.9)
barley (9.0)	grasses	pasture (grass)	stubble, fallow (fall)
corn	non-crop areas	rangeland	turf (established)
			wheat [spring (8.7), winter (8.6)]

*Use only if crop is heavily infested with MCPA resistant weeds; crop injury may occur.

4. WEEDS CONTROLLED:

Note: First rating amine; second rating ester.

bluebur	lamb's-quarters (8.0)(8.3)	pigweed, Russian (7.0)	spurge, thyme-leaved
burdock	lettuce, prickly	plantain, common	stinkweed** (7.2)(7.7)
cocklebur	mustard (8.3)(8.2)(ball,	radish, wild	sunflower, wild
clover, sweet	hare's-ear Indian,	ragweeds (common, false, giant	vetch
flixweed (4.6)(7.4)**	tumble, wild, wormseed)	shepherd's-purse (8.6)(8.0)**	
kochia (5.9)(7.3)			
More Resistant Weeds:			
dock, curled	goosefoot, oak-leaved	pigweed (prostrate,	purslane, common
false flax, small-seeded	lady's-thumb	redroot (-)(6.6), tumble)	smartweeds, annual (6.5)(5.5)
galinsoga, hairy	mustards (dog, tansy)	pineappleweed	thistle, Russian (8.0)(7.5)
goat's-beard	peppergrass (common, field)		

**For the control of fall rosettes in stubble or fallow, apply to emerged weeds prior to freeze-up.

5. WEEDS SUPPRESSED: Top control or suppression.

alfalfa	buttercup, creeping	hawk's-beard,	sow-thistles [annual (6.2),
bindweed (field, hedge)	cress, hoary	narrow-leaved	perennial]
buckwheats	dandelion (3.0)(-)	horsetail, field	spurge, leafy
[tartary (5.2)(4.9)	gumweed	knapweed, Russian	thistle, Canada (4.6)(5.4)
wild (4.8)(5.3)]		lettuce, blue	wormwood, biennial

6. WHEN USED:

Grasses (seedling): 3 leaf to just before flag leaf.
Asparagus: Just before first spears appear. May be repeated at end of cutting season.
Barley, rye, wheat (spring): 3 leaf expanded to just before flag leaf.
Rye (fall), wheat (winter): Early spring, before flag leaf.
Corn: Up to 15 cm tall; 15-20 cm tall, use drop nozzles to keep spray off corn.
Flax (Emergency Use Only; MCPA preferred): After 5 cm to early pre-bud.
Oats (Emergency Use Only; MCPA preferred): Up to 3 leaf; 6 leaf to early flag leaf.

7. HOW TO APPLY:

With: Aircraft or Ground equipment.
Water Volume: Aircraft: 12 L/ac minimum. Ground: Barley, corn, oats, rye, wheat: 40-80 L/ac; Flax: 45-70 L/ac recommended; Pasture, rangeland, turf: 182 L/ac.
Pressure: Air: 235 kPa or less; Ground 200-275 kPa.
Rate: Recommendations vary from label to label.

FORMULATION AND CONCENTRATION (Quantity/ac)

Crop	Amine 500	Ester 500	Ester 600	Ester 700
Grasses (seedling)	200-445 mL	NRF	NRF	NRF
Asparagus	140 mL	NRF	NRF	NRF
Barley, rye, wheat	285-445 mL	170-470 mL	210-385 mL	190-345 mL
Resistant weeds in cereals	505-710** mL	465-750** mL	375-610** mL	375-445** mL
Corn	200-445 mL	NRF	285 mL	NRF
Flax (Emergency only)	285-710*** mL	NRF	285 mL	NRF
Non-crop areas	0.7-2.3 L	1.2-1.9 L	1.5 L	1.3-2.5 L
Oats (Emergency only)	285-710 mL	NRF	210-610 mL	NRF
Pasture, rangeland, turf.	0.81-1.7 L	0.75-2.1 L	0.61-1.1 L	0.61-1.0 L
Stubble, fallow (fall)	340-445 mL	340-445 mL	NRF	NRF
Fallow	0.31-1.3 L	0.5-1.3 L	NRF	NRF

*NRF-No Recommendation Found.
**Higher rates can be used if weed infestation is high, but some crop injury may occur.
***Rates over 607 mL/ac may cause a delay in maturity.

8. APPLICATION TIPS: Recommendations vary from label to label, **read label** of product used. Do not use on sanfoin, bentgrasses, or freshly seeded turf. Spray during warm weather when the weeds are young and growing actively. At high temperatures vapourization of more volatile esters may cause injury to susceptible plants.

9. HOW IT WORKS: This hormone type herbicide causes abnormal growth, and affects respiration, food reserves and cell division in broadleafed plants. Absorbed primarily by leaves and stems and translocated to the growing tips and roots.

10. EXPECTED RESULTS: Susceptible plants become malformed before they die.

11. **EFFECTS OF RAINFALL:** A rain free period of 2 hours for esters, 4 hours for amine and 6 hours for salts is needed after application.
12. **MOVEMENT IN SOIL:** Leaching does not pose a problem.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze for at least 24 hours after treatment. Do not graze treated area within 1 day of slaughter. Tank mixes: Check label of other product for grazing restrictions.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = technical (300-1,200). Some formulations may cause skin irritation. Some formulations are toxic to fish.
15. **PRECAUTIONS, FIRST AID:** May cause burns and can be absorbed through the skin. Wear standard protective clothing (see page xx) and goggles. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If Amine** formulations **swallowed** seek medical attention. **If Ester** formulations **swallowed** seek medical attention.
16. **STORAGE:** Do not freeze amine, if frozen warm to 4°C and mix thoroughly before using.

2, 4-D (LV ester)

(Industrial)
DowElanco/Rhône - Poulenc

WARNING POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; Low volatile ester; 570 g/L. Estasol LV600: 8 L jug; Esteron 600: 20, 205 L drum; No Weed 2,4-D: 10 L jug; 2,4-D Ester LV600: 20 L pail.
2. **REGISTERED MIXES:** bromacil, dicamba, dicamba+dichlorprop, dichlorprop, picloram, sodium TCA.
   Mixing Restrictions: Carriers: water, oil. Use only diesel oil No. 1 or No. 2 fuel oil or kerosene where oil is recommended. When using oil carriers do not allow water to get into product or spray tank. (Oil mixes are very expensive, use may be limited to small areas during the dormant season.) Add 1/3 of the carrier, start agitation, add herbicide, then remainder of the carrier.
3. **CROPS:** Industrial and forestry locations. To control unwanted vegetation.
4. **WEEDS CONTROLLED:**
   Brush: Alder, birch, cherry, elm, hazelnut, maple (Manitoba), poplar (balsam, trembling aspen), snowberry (western), sumac, willow.
   Weeds: Common broadleaf weeds.
5. **WEEDS SUPPRESSED:** Canada thistle, field bindweed.
6. **WHEN USED:**
   Foliar Treatment: After foliage is fully developed.
   Stump Treatment: On freshly cut stump any time including winter.
   Basal Bark Treatment: Any time. Do not cut for 1 year after application.
7. **HOW TO APPLY:**
   With: Aircraft or Ground equipment.
   Rate:
   Aircraft:
   Brush Control: 6.6 L in 30 L of spray solution.
   Snowberry, willows: 1.33 L/ac.
   Ground:
   Foliar Treatment: 8 L in 1000 L of water.
   Stump Treatment: 30 L in 1000 L of diesel oil, fuel oil, or kerosene.
   Basal Bark Treatment: 20-30 L in 1000 L of diesel oil, fuel oil, or kerosene.
   Frill Treatment: 30 L in 1000 L oil.
   Broadleaf Weeds: 405 mL/ac-1.6 L/ac.
   Pressure: Aircraft: 235 kPa or less. Ground: up to 1700 kPa.
8. **APPLICATION TIPS:** Wet all foliage and stems to point or runoff. Spray during warm weather when weeds and brush are actively growing. Continuous agitation is required for the oil-water mixture. Do not apply by air in dead-calm conditions as the "cloud" of suspended droplets may drift when wind comes up.
9. **HOW IT WORKS:** Absorbed through leaves and bark in trees. A hormone type herbicide causing an abnormal growth.
10. **EXPECTED RESULTS:** Brown crisp leaves first appear then death.
11. **EFFECTS OF RAINFALL:** A rain free period of 4-6 hours is needed after application.
12. **MOVEMENT IN SOIL:** Minimal soil movement. 30 day half-life.
13. **GRAZING AND CROPPING RESTRICTIONS:** Intended for non-crop areas only. Use only on established turf grasses except creeping grasses such as bentgrass. Avoid spray drift.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (300-1,000). Some formulations may cause skin irritation. Toxic to fish and should not be introduced into aquatic environments.

15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store away from fertilizers, seeds, insecticides, fungicides or other herbicides intended for use on 2,4-D sensitive crops. If frozen, bring to room temperature before using.

EDGE (ethalfluralin)

DowElanco

1. **FORMULATIONS:** Dry Flowable; 50%; 9.1 kg bag. Granular; 5%; 22.7 kg bag and 454 kg returnable bag; Dispersible Concentrate; 60%; water soluble packets; 15 kg case.
2. **REGISTERED MIXES:** Dry Flowable; fertilizer (liquid, dry). Edge 5G and Edge 60 DC - none.
   Mix Restrictions: Liquid Fertilizer: Do a compatability test before using. Use a minimum of 45 L/ac.
   Dry Fertilizer: apply a minimum of 135 kg/ac in spring or 100 kg/ac in fall. Ammonium nitrate must not be impregnated with Edge DF.
   Mix Instructions: Edge DF alone: Do not preslurry. Proper agitation is very important. Add 1/2 required amount of water to tank, start agitation, slowly add 1/2 required amount of Edge. Continue filling with water, gradually adding remaining Edge. Continue agitation for at least 5 minutes after filling and maintain throughout operations. Edge DC alone: Vigorous, continuous agitation is essential for proper mixing. Do not preslurry. Fill tank 1/3 full with clean water and begin agitation. Add the Edge DC packets directly into the tank. Fill the remainder of the tank. If foaming is a problem, the use of Halt anti-foaming agent is recommended. Continue agitation for at least 5 minutes after filling and maintain throughout operation.
3. **CROPS:** Alfalfa (establishment), canola (9.0) (including triazine tolerant), caraway, coriander, dill, fababeans, mustard (yellow) (8.6), peas (9.0), safflower (9.0), soybeans, sunflowers (8.7), dry common beans (white or kidney).
4. **WEEDS CONTROLLED:**

blueweed	grass [barnyard (8.2), crab]	panicum, fall
buckwheat, wild (8.3)	kochia (7.0)	pigweed [prostrate, redroot (8.2)]
chickweed (7.3)	lamb's-quarters (8.6)	purslane
cockle, cow	oats, wild (8.2)	spurry, corn
foxtail [giant, green (8.5), yellow]		wheat, volunteer (7.9)

5. **WEEDS SUPPRESSED:** Barley (volunteer) (6.3), cleavers (6.4), hemp-nettle, lady's-thumb (7.7), nightshade (American, black), thistle (Russian).
6. **WHEN USED:**
   Fall: Between September 1 and soil freeze-up.
   Spring: Cultivate to destroy weeds; apply prior to seeding crop.
7. **HOW TO APPLY:**
   With: Ground equipment only.
   Water Volume: 45 L/ac.
   Incorporation: First incorporation must be done within 24 hours of application. Second incorporation should be done at right angles to the first.
   Spring Application: Apply Edge 5G, Edge DF or Edge 60 DC when the soil is in good working condition. Insure that the early season flush of weeds are killed by either first or second incorporaation. Seed into a weed free seedbed using accepted cultural practices.
   Fall Application: It is recommended that both incorporations be completed in the fall. For optimum weed control, prework the field early in the spring to promote germination of weeds and to allow green growth of resistant weeds to develop. Use a 5-8 cm deep cultivation with Vibrashank type cultivator or disc prior to seeding to destroy existing green growth. Seed into a weed free seedbed using accepted cultural practices.
   Edge 5G: Delay second incorporation a minimum of 3 days. This allows time for greater release of Edge from the granule into the soil and assures a more uniform distribution.
   Implements: A tandem disc, discer, or field (vibrashank) cultivator is recommended. Set to work 8-10 cm deep. Disc implements at 7-10 km/hr; cultivators at 10-13 km/hr. Do not use a field cultivator to incorporate when soil is crusted, lumpy, or too wet for good mixing. A tandem disc gives best mixing action on stubble.
   Pressure: 275 kPa.
   Nozzles: Screens 16 mesh or coarser for the filter on inlet side of pump. Screens 50 mesh or coarser for spraying.

Rate:

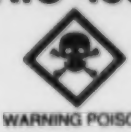
Soil Zone; Organic Matter	Spring Sand to Sandy Loam	Spring Loams to Clays	Fall Sand to Sandy Loam	Fall Loams to Clays
	50% D.F.**	**50% D.F.****	**50% D.F.****	**50% D.F.****
Dark Brown; 2-4%	0.65 kg/ac	0.65 kg/ac	0.89 kg/ac	0.89 kg/ac
Black; 4-6%	0.65 kg/ac	0.89 kg/ac	0.89 kg/ac	1.13 kg/ac
Deep Black; 6-15%;	0.89 kg/ac	0.89-1.13 kg/ac*	1.13 kg/ac	1.13 kg/ac
	5% G.**	**5% G.****	**5% G.****	**5% G.****
Dark Brown; 2-4%	6.9 kg/ac	6.9 kg/ac	8.9 kg/ac	8.9 kg/ac
Black; 4-6%	6.9 kg/ac	8.9 kg/ac	8.9 kg/ac	11.3 kg/ac
Deep Black; 6-15%	8.9 kg/ac	8.9-11.3 kg/ac*	11.3 kg/ac	11.3 kg/ac
	60% D.C.**	**60% D.C.****	**60% D.C.****	**60% D.C.****
Dark Brown; 2-4%	0.57 kg/ac	0.77 kg/ac	0.77 kg/ac	0.77 kg/ac
Black; 4-6%	0.57%	0.77 kg/ac	0.77 kg/ac	0.93 kg/ac
Deep Black; 6-15%	0.77 kg/ac	0.77-0.93 kg/ac*	0.93 kg/ac	0.93 kg/ac

*For improved results, use higher rates for fields with high populations of weeds.
**D.F. - Dry Flowable; G. - Granular; D.C. - Dispersible Concentrate.

8. **APPLICATION TIPS:** To avoid concentrating wild oat and volunteer cereal seeds below the treated layer, do not plow the land prior to Edge application. Do not apply to fields spread with manure during the past 12 months. Do not apply on peat or muck soils or soils with greater than 15% organic matter. Do not apply to soils subject to prolonged periods of flooding or soils in poor working condition. If swath from previous crop has been removed by burning, cultivate once to remove the charcoal layer prior to Edge application. Do not apply Edge DF or DC on soils with more than 20-25% straw cover. Chop and thoroughly mix crop residues into the soil prior to the application of Edge DF or DC. Edge 5G can be used where trash is heavier or on standing weeds provided that they do not interfere with distribution of the granules and do not limit incorporation.
9. **HOW IT WORKS:** A pre-emergence herbicide which kills seedlings as they germinate. Inhibits all division in the actively growing points of the root and shoot. Does not control established weeds.
10. **EXPECTED RESULTS:**
Weeds: Most die before emerging. Weeds will exhibit swelling of the coleoptile region; stubby, thick primary root development and lack of secondary roots. Plants die from lack of ability to obtain moisture.
11. **EFFECTS OF RAINFALL:** No effect once incorporated into the soil.
12. **MOVEMENT IN SOIL:** None.
13. **GRAZING AND CROPPING RESTRICTIONS:** None.
Crop Use After Hail: No restriction.
Succeeding Crops: Will not harm typical crops if used as directed. As a precaution, very sensitive crops such as sugar beets or small-seeded grasses such as timothy or canary seed should not be grown following an Edge treated crop. Over application caused by overlapping, improper calibration, non-uniform application, may reduce stands of crops grown in rotation.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (technical) greater than 5,000. Direct contamination of any body of water may kill fish.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) including gloves (**not** leather or cloth). **If in eyes or on skin** use standard first aid measures (see page xxiii). If irritation develops, get medical attention. **If swallowed** seek medical attention.
16. **STORAGE:** Store in areas not exposed to high temperatures or prolonged direct sunlight. Do not let Edge 5G remain in standing applicator under these conditions.
17. **RESISTANCE MANAGEMENT:** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, FREE FLOW, HERITAGE**, TRIFLUREX, RIVAL AND FORTRESS) will not control trifluralin tolerant Green Foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use of these products repeatedly in the same field, or use a separate herbicid applicatio n for control of trifluralin tolerant green foxtail.

EMBUTOX 625; 2, 4-D BUTYRIC 400; SEE BUTYRIC 480
COBUTOX 400(2, 4-DB)

Rhône - Poulenc/United Agri Products/IPCO



WARNING POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 400 g/L; 4 L, 10 L,, 20 L containers. Embutox 625; 625 g/L; 8 L jug. See Butyric 480; 480 g/L, 10L containers.
2. **REGISTERED MIXES:** Avenge (refer to Avenge label for details).
3. **CROPS:**

alfalfa, seedling (8.0)	corn (field)	trefoil, bird's-foot (seedling)
barley (9.0)	oats (8.2)	wheat (spring)(8.8)
clovers (alsike, white)(8.9)	pastures (9.0)	

4. **WEEDS CONTROLLED:**

buckwheat, wild (5.7)	lamb's-quarters (8.5)	ragweed
chicory	mustard (ball, wild**,	shepherd's-purse (6.5)
dock, curled (8.0)	wormseed) (5.8)	stinkweed
goose-foot, oak-leaved	pigweed, redroot (7.5)	thistle, bull
hawk's-beard, narrow-leaved*	plantain	yellow rocket

*Fall application for legumes.
**For better control tank mix with MCPA.

5. **WEEDS SUPPRESSED:**

bindweed, field	lady's-thumb	sow-thistle, perennial (5.4)
dandelion	smartweeds, green (5.4)	thistle, Canada (5.4)
horsetail		

6. **WHEN USED:**
Weeds: 1-3 leaf (seedling) stage.
Narrow-leaved hawk's-beard: Rosette stage in late fall after alfalfa has become dormant but weeds are still growing.
Legumes: Seedling alfalfa, bird's-foot trefoil: 1-4 trifoliate leaf. Seedling white, alsike clover: after the first trifoliate leaf.
Cereals: 5th leaf to early flag leaf.
Field Corn: After crop is 38 cm high but before the beginning of tasselling.
Pastures: After cutting or grazing, and before regrowth is 7.5 cm tall.
7. **HOW TO APPLY:**
With: Ground equipment.
Water Volume: 60-80 L/ac.
Pressure: 275 kPa.
Rate:

Crop	Embutox 625 (L/ac)	Cobutox 400 (L/ac)	2,4-D Butyric 400 (L/ac)
Alfalfa, bird's-foot trefoil (seedling; direct or underseeded).	0.7-0.9	1.1-1.4	1.4
Barley, oats, wheat.	0.7-0.9	1.1-1.4	1.4
Clovers (seedling; direct or underseeded).	0.7-0.9	1.1-1.4	1.4
Corn (field)	0.7-0.9	1.1-1.7	1.7
Pasture (containing legumes).	0.7-1.1	1.1-1.7	1.7
Perennial weeds	0.9-1.1	1.1-1.7	1.7
Dandelion, horsetail, smartweeds*.	1.1	1.7	1.7

*Seedlings only stunted.

8. **APPLICATION TIPS:** Damage to forage legumes (especially to established alfalfa) may occur and increase in severity the longer treatment is delayed beyond stage recommended. Do not spray in drought conditions. Oats are sensitive if treated before the 5 leaf stage. For better wild mustard control: tank mix with MCPA salt for use on seedling alfalfa and bird's-foot trefoil - some crop stunting may occur.
9. **HOW IT WORKS:** Susceptible plants convert 2,4-DB to 2,4-D. Certain legumes do not convert it. 2,4-DB is translocated to actively growing parts.
10. **EXPECTED RESULTS:** Weeds should die within 2-3 weeks of treatment. Smartweeds seedlings only stunted.
11. **EFFECTS OF RAINFALL:** Rainfall before the foliage has dried from the spraying may decrease activity.
12. **MOVEMENT IN SOIL:** Leaching does not pose a problem.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for livestock feed in the year of treatment.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (1,960). Toxic to fish. Non-toxic to birds and bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.

16. **STORAGE:** If Cobutox 400 or 2,4-D Butyric 400 freezes it can be reactivated by warming to 20-22°C and agitating thoroughly. Cobutox 400 and Embutox 625 do not require heated storage.

EPTAM (EPTC)

ICI Chipman

CAUTION POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; Eptam 8-E; 800 g/L; 10 L can.
2. **REGISTERED MIXES:** Eptam 8-E+Lexone or Sencor (Irish potatoes), liquid or granular fertilizers (except nitrate based ones).
   Mix Restrictions: Check fertilizer compatibility before tank mixing.
3. **CROPS:** Alfalfa (7.7), bird's-foot trefoil, dry beans (7.8), snap beans (8.7), flax (7.5), Irish potatoes (8.8), sunflowers (7.8), turnips (rutabagas) (8.0), sugar beets (8.3).
   Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**
   barley, volunteer (7.0)
   barnyard grass (8.6)
   bluegrass, annual (7.2)
   chickweed, common
   foxtail [green (7.7), yellow (8.4)]
   henbit
   lamb's-quarters (6.4)
   nightshade, hairy (6.3)
   oats [volunteer, wild (8.1)]
   pigweed [prostrate,
   redroot (6.3), tumble]
   purslane
   quackgrass
   ryegrass, Italian (8.4)
   spurry, corn (9.0)
   wheat, volunteer (7.9)
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Alfalfa, bird's-foot trefoil (seedings): Pre-planting. Do not use if seeding a grain or grass nurse crop.
   Beans [snap or dry (including Red Kidney)] Pre-planting. Do not use on cow peas; or Adzuki, soy, lima, or other flat podded beans except Romano.
   Flax, sunflower: Spring - Pre-planting. Do not apply in spring to soils with less than 3% organic matter. Fall - Before freeze-up. Cultivate lightly to destroy any overwintering rosettes in spring, before seeding.
   Potatoes: Incorporate in the fall or spring, after pre-emergence cultivation, or before the last cultivation. Eptam 8-E can also be metered into sprinkler irrigation equipment (**read label** for instructions).
   Turnips: Apply and incorporate 6-10 days before planting.
   Sugar Beets: In sprinkler irrigation water.
   Note: Fall application should not be used in areas where soil drifting is a hazard.
7. **HOW TO APPLY:**
   With: Ground equipment or irrigation water.
   Water Volume: 45 L/ac minimum.
   Incorporation: Incorporate immediately. Second incorporation must be at right angles to the first. Power-driven cultivation equipment, set to cut 5-7.5 cm deep. Tandem, one way discs, set to cut 10-15 cm and operate at 6.5-9.5 km/h followed by harrows. Field cultivators, for lighter soils in good tilth. Use 3-4 rows of sweeps spaced no wider than 18 cm. Cut 10-15 cm deep at 9.5 km/h. Pull a levelling devise (such as harrows) behind incorporating equipment.
   Pressure: 275 kPa.
   Rate:

Crop	Eptam 8-E L/ac	Crop	Eptam 8-E L/ac
Alfalfa, bird's-foot trefoil.	1.7	Potatoes (pre-plant, pre-emergent)	1.7-3.4
Beans (dry, snap) (See exceptions in When Used)	1.7-2.2	Potatoes (post-emergent)	1.7-2.2
		Potatoes (sprinkler)	1.7-2.2
Flax (spring; sandy soil)	1.4	Potatoes (fall)	2.2-3.4
Flax (spring; clay soil)	1.7	Sugar beets (sprinklers)	1.1-1.7
Flax (fall; sandy soil)	1.7	Sunflowers (spring)	1.7
Flax (fall; clay soil)	2.2	Sunflowers (fall)	1.7-2.2
(Do not use on Flax south of Highway 1 in Alberta)		Turnips (sandy soil)	1.3
		Turnips (clay soil)	1.7

   *NR-Not Registered.
8. **APPLICATION TIPS:** For use on mineral soils only. When applying Eptam 8-E with granular fertilizer, a minimum of 81 kg/ac and a maximum of 324 kg/ac of fertilizer is required. See product label for further instructions.
   Flax, Special Instructions: Seed shallow, less than 3 cm, into a firm seedbed. Deep seeding reduces stands.
9. **HOW IT WORKS:** Taken up by the roots and shoots of a germinating weed where it disrupts and stops further growth.
10. **EXPECTED RESULTS:**
    Weeds: Absorbed by the weed shoot, therefore, most affected weeds will not emerge. Numerous chlorotic and bleached shoots may be visible by removing the top few inches of treated soil. Provides effective weed control for approximately 6-8 weeks.

Crops: If crop seedlings are weak, some injury may occur.

11. **EFFECTS OF RAINFALL:** Very soluble in water so excessive moisture may cause leaching (usually not a problem in Alberta).
12. **MOVEMENT IN SOIL:** Eptam will move readily in the soil.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for livestock feed in year of treatment.
    Harvest Restriction: Pre-harvest interval (days) after treatment - potatoes (45).
    Succeeding Crops: No restrictions.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (1,600). Very toxic to fish. Non-toxic to birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Heated storage not required. Store away from seed and fertilizer.

ERADICANE 8-E (EPTC)

ICI Chipman

1. **FORMULATIONS:** Emulsifiable Concentrate; 800 g/L; 10 L jug.
2. **REGISTERED MIXES:** Atrazine (80W or F), liquid fertilizer, granular fertilizer, urea and urea blends.
   Mix Restrictions: Check fertilizer compatability before tank mixing.
3. **CROPS:** Corn (field, sweet) (9.0).
4. **WEEDS CONTROLLED:**

barley, volunteer (7.0)	foxtail [green (7.7), yellow]	oats (volunteer, wild)(8.1)	quackgrass
barnyard grass (8.6)	henbit	pigweed [prostrate,	ryegrass, Italian
bluegrass, annual	lamb's-quarters (6.4)	redroot (6.3), tumble	spurry, corn
chickweed, common	nightshade, hairy (6.3)	purslane	wheat, volunteer (7.9)

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Apply, incorporate, and seed corn as soon as possible.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Water Volume: 45 L/ac minimum.
   Incorporation: Within minutes of application. Use power-driven cultivation equipment, set to cut 5-7.5 cm deep or discs set 10-15 cm - both these types of equipment should operate at 6.5-9.5 km/h. A second working, at right angles to the first will provide adequate mixing. Pull a levelling devise (such as harrows) behind incorporating equipment.
   Pressure: 275 kPa.
   Rate:

Crop	L/ac
Corn (field, silage)	1.7-3.4
Corn (sweet)	1.7-2.2
Sandy soils	1.7
Clay soils	2.2
Annual weed control	2.2 (maximum)
Quackgrass control	3.4

8. **APPLICATION TIPS:** Proper soil coverage and immediate and adequate soil mixing are important.
9. **HOW IT WORKS:** Absorbed by roots and shoots of a germinating weed, disrupts and stops growth and causes eventual death.
10. **EXPECTED RESULTS:**
    Weeds: Affected weeds do not emerge, chlorotic and bleached shoots are visible by removing a layer of treated soil.
    Crops: Weak seedlings may be injured. **Poor results may be expected** if soils are wet, cloddy and trashy; not suitable for proper application or incorporation.
11. **EFFECTS OF RAINFALL:** Very soluble therefore, excessive moisture may cause leaching (usually not a problem in Alberta).
12. **MOVEMENT IN SOIL:** Will move readily.
13. **GRAZING AND CROPPING RESTRICTIONS:** No restrictions on grazing, crop use after hail nor on succeeding crops. Danger from drift is low.
    Caution: Excessive incorporation required may cause erosion on some soil.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (1,600).
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Heated storage not required.

ESTAPROP/DIPHENOPROP 600/SEE DIPHENOPROP (2,4-D+ dichlorprop)

Rhône - Poulenc/United Agri Products

WARNING POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 282 g/L 2,4-D ester isomer specific + 300 g/L dichlorprop; Estaprop 8 L container; Diphenoprop 600; 10 L containers; SEE Diphenoprop; Solventless Concentrate; 222 g/L 2,4-D + 222 g/L dichlorprop; 10L containers.
2. **REGISTERED MIXES:** Avenge (barley, Avenge wheat varieties).
   Mix Instructions: Add 2,4-D + dichlorprop. Agitate. Add Avenge.
3. **CROPS:** Barley (8.1), wheat [spring (8.2), winter (8.9)].
   Underseeding: Legumes not recommended.
4. **WEEDS CONTROLLED:**

bluebur (9.0)	goosefoot, oak-leaved	mustard [ball, dog,	shepherd's-purse (7.8)
buckwheat	kochia (8.1)	hare's ear, Indian,tumble,	smartweeds (6.9)
[tartary (8.2), wild (6.8)]	lady's-thumb	wild (8.6), wormseed]	sow-thistle, annual (7.6)
burdock	lamb's-quarters (8.4)	pigweed [redroot (7.9),	stinkweed (8.4)
catchfly, night-flowering	mallow, round-leaved (6.9),	Russian]	stork's bill (7.3)
cocklebur	(Estraprop only)	ragweeds	sunflower, volunteer
flixweed (7.6)		rapeseed, volunteer	thistle, Russian (8.1)

5. **WEEDS SUPPRESSED:** Sow-thistle (perennial), thistle [Canada (5.6)], curled dock, toadflax,** mallow (round-leaved) (Diphenoprop only).
6. **WHEN USED:** Spring seeded crops: 4 leaf to early flag leaf. Fall seeded crops: full tillering to flag leaf, apply only in spring. Early spraying of stork's bill, round-leaved mallow and kochia gives good control.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Rate: 710 mL/ac.
   Water Volume: 20-80 L/ac.
   Pressure: 275 kPa.
8. **APPLICATION TIPS:** Crops under stress from adverse environmental conditions such as excess moisture, drought, or disease may suffer a further setback when Estaprop is applied; however, the crop injury that may occur is usually offset by weed control obtained.
9. **HOW IT WORKS:** A systemic herbicide absorbed by leaf and stem.
10. **EXPECTED RESULTS:** Twisting and curling of weeds will commence 2-10 days after application. Growth ceases, eventually plants turn brown and die. **Poor results may be expected if** poor coverage. Low relative humidity during and after spraying.
11. **EFFECTS OF RAINFALL:** Rain within 3 or 4 hours of application may reduce control.
12. **MOVEMENT IN SOIL:** Leaching does not pose a problem.
13. **GRAZING AND CROPPING RESTRICTIONS:** Drift over susceptible crops will cause injury. Do not graze or feed to livestock in year of treatment.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = 2,4-D (300-1000), dichlorprop (800). Toxic to bees.
15. **PRECAUTIONS, FIRST AID:** May be absorbed through the skin and may cause burns. Do not spray on foraging bees. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** May be stored at any temperature. Shake well after storing for 1 year or longer.
    **Toadflax: Apply when the majority of the toadflax are no taller than 15 cm. The degree of suppression will vary with the size of toadflax and environmental conditions prior to and following treatment. Use of Estaprop for suppression of toadflax in wheat or barley is part of a long-term planned approach for toadflax control. Do not apply before the 4-leaf stage or between flag leaf to full-headed stages.
    Note: This is a minor use registration and may or may not appear on the current product label.

ESTAPROP/DIPHENOPROP 600
(2,4-D + dichlorprop)

(Industrial)

Rhône - Poulenc/United Agri Products

1. **FORMULATIONS:** Emulsifiable Concentrate; Estaprop/Diphenoprop 600; 282 g/L 2,4-D ester isomer specific + 300 g/L dichlorprop; Estaprop 8 L jug, Diphenoprop 600: 10 L containers.
2. **REGISTERED MIXES:** DyCleer, fuel oil (basal, frill, stump).
   Mix Instructions: Add 1/2 amount of carrier, start agitation, add herbicide, then add rest of carrier. In water, agitate to prevent separation. In oil, do not let water get into mixture.
3. **CROPS:** Non-crop areas, industrial areas, rights of way, roadsides.
   Underseeding: Not applicable.
4. **WEEDS CONTROLLED:**

Brush: Group 1	**Group 2**		
cedar, white	alder	fir, balsam	pine (red, Scotch)
cherry, wild	apple, wild	hardhack	poison-ivy
hawthorn	aspen	hazel	raspberry, tame
maple, sugar	basswood	hickory	sumac
pine, Scotch	birch	honeysuckle	tamarack
plum, wild	blueberry	juniper, ground	willow
poplar	elderberry	maple (Manitoba, silver)	
raspberry, wild	elm	oak (bur, white)	

Weeds (also weeds listed for Estaprop, Diphenoprop 600)			
alfalfa	clover, sweet	hawkweed	tansy
burdock	dandelion	horsetail	teasel
buttercup	dock, curled	mullein	thistle (bull, Canada)
carrot, wild	dogbane	plantain	vetch
chicory	goat's-beard	sow-thistle, perennial	yellow rocket
cinquefoil	goldenrod		

5. **WEEDS SUPPRESSED:** Milkweed, toadflax.
6. **WHEN USED:**
   Brush Control: Apply on foliage and stems just prior to or just after brush is in full leaf in late spring or early fall. Many species may require retreatment the following year.
   Basal Treatment (not ash or basswood): Any time of year.
   Frill Treatment: Standing trees more than 13-15 cm in diameter.
   Stump Treatment: Immediately after cutting.
   Weeds: During May or in early fall. Some species may require a second treatment.
7. **HOW TO APPLY:**
   With: Power equipment, knapsack sprayer.
   Rate:
   Brush Control (rate/1000 L of water): Group 1 (see Weeds Controlled): Estaprop 8.75 L; Diphenoprop 8.0 L. Group 2 - Estaprop 11.7 L; Diphenoprop 11.0 L.
   Basal (not ash or basswood)(rate/100 L of fuel oil): Group 1: Estaprop 3.25 L; Diphenoprop 2.4 L. Group 2: Estaprop 5.1 L; Diphenoprop 3.2 L.
   Frill/Stump Treatment (rate/100 L fuel oil): Estaprop 3.25 L; Diphenoprop 3.2 L.
   Weeds: Estaprop/Diphenoprop 1.6 L/ac.
   Water Volume:
   Ground: Brush Control 305-610 L/ac depending on brush density and height. Weeds 80-240 L/ac, spray to point of runoff.
   Pressure: As recommended for equipment used.
8. **APPLICATION TIPS:** Thoroughly wet down all foliage and stems to ground level. Do not spray during high winds or high temperatures.
9. **HOW IT WORKS:** A translocated, systemic herbicide absorbed by leaves.
10. **EXPECTED RESULTS:** Leaves brown and wilt shortly after spraying - no leaves appear the following year.
11. **EFFECTS OF RAINFALL:** Rain within 3 or 4 hours after application may reduce control.
12. **MOVEMENT IN SOIL:** Leaching does not pose a problem.
13. **GRAZING AND CROPPING RESTRICTIONS:** No grazing restrictions specified.
    Drift: Over susceptible crops causes injury.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = 2,4-D (300-1000); dichlorprop (800). Toxic to bees.

15. **PRECAUTIONS, FIRST AID:** May be absorbed through the skin and may cause burns. Do not apply when bees are foraging. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** If frozen, warm to 5°C and mix well.
Note: Similar products are Desormone LV700/Diphenoprop 700.

EXCEL (fenoxaprop-ethyl)

Hoechst

1. **FORMULATIONS:** Emulsifiable concentrate; 90 g/L; 10 L/jug.
2. **REGISTERED MIXES:** Lontrel (400mL/ac) [canola, triazine tolerant canola], Bladex (1.2 L/ac) [triazine tolerant canola].
Mixing Instructions: Add Broadleaf herbicide first prior to adding Excel. Agitate. Mix Excel at 0.91 L/ac only.
3. **CROPS:** Broccoli (8.9), buckwheat (tame) (8.8), cabbage (9.0), cauliflower (9.0), flax (9.0), lentils (8.4), tame mustard (9.0), onions (dry bulb) (9.0), peas (field (8.8) and processing (9.0)), potatoes (9.0), rapeseed (8.7) (canola, including triazine tolerant canola), sunflowers (8.9).
4. **WEEDS CONTROLLED:** Wild Oats (7.7), foxtail [green (8.7) and yellow], barnyard grass (8.7), volunteer barley (7.3), volunteer corn.
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
Weeds: 1-6 leaf stage for wild oats, green and yellow foxtail, volunteer barley, barnyard grass and volunteer corn 5-25 cm high.
Crops: No leaf stage restriction.
7. **HOW TO APPLY:**
With: Ground Equipment.
Rate: Rapeseed, canola (incl. T.T.C.), buckwheat, mustard, peas: 0.91 L/ac; broccoli, cabbage, cauliflower, flax, lentils, onions, potatoes and sunflowers: 1.00 L/ac.
Water Volume: Ground: 45 L/ac.
Pressure: Ground: 275 kPa.
Nozzles: Only 110° or 80° stainless steel flat fan nozzles are recommended. Uniform, thorough coverage is important to achieve good control.
8. **APPLICATION TIPS:** Do not delay Excel application if annual grass weeds are in the correct stage for Excel application before broadleaved weeds have emerged. Under stress environmental conditions and when plants are not actively growing, avoid application of a tank mix. During periods of stress, plants are not actively growing. When daytime temperatures are very hot (28°C or 82°F) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Excel during these periods may result in substantially reduced control. Under these conditions, yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. Good spray coverage and penetration may be difficult if weed populations are extremely high. Apply the spray at a forward angle of 45° and ensure that weeds are young and actively growing. Do not use the Bladex tank-mix when weeds are under stress, as reduced control may result. A time interval of four (4) days before or after application of Excel is required before application of any other pesticides (except Excel registered tankmixes).
9. **HOW IT WORKS:** Contact as well as systemic action, no soil activity. Regions of high meristematic activity, such as the root and shoot tips, are known to be affected.
10. **EXPECTED RESULTS:** Reduction of leaf growth and chlorotic blotching within 1-3 days after application. Secondary root growth and leaf growth arrested within 4-6 days after application. Initial development of leaf chlorosis within 5-8 days after application and complete death of plant 14-21 days after application.
11. **EFFECTS OF RAINFALL:** Do not apply if rain is expected within 3 hours.
12. **MOVEMENT IN SOIL:** Excel appears to undergo rapid hydrolysis in the soil.
13. **GRAZING AND CROPPING RESTRICTIONS:**
Grazing Restrictions: Do not graze treated fields prior to harvest.
Pre-Harvest Intervals: Broccoli, cabbage, cauliflower, flax, potatoes, onions, tame mustard (all 60 days). Canola (incl. T.T.C.), rapeseed (80 days). buckwheat, peas, lentils (all 90 days). Sunflowers (100 days).
Succeeding Crops: No restriction.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = 2680. Toxic to fish. Nontoxic to birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce skin and eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Do not store below freezing. If stored for one year or longer, shake well before using.

FORTRESS (triallate + trifluralin)

Monsanto

1. **FORMULATIONS:** Granular; 10% triallate + 4% trifluralin; 22.7 kg bag.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Barley (8.9), flax (8.0), mustard (9.0), rapeseed (9.0) (including canola), wheat [durum (9.0), spring (8.2)].
4. **WEEDS CONTROLLED:** Green (7.1) and yellow foxtail, wild oats (7.3).
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Spring: Pre-plant incorporated on barley, flax, spring and durum wheat and rapeseed. Do not apply preplant with wheat in soils with 0-4% organic matter.
   Fall: Apply in fall, after September 15 until soil freeze-up. Do not apply preplant with wheat in soil with less than 2% organic matter.
   Note:
   Fall applications: Where erosion may be a problem, maximize crop residue cover with only one fall tillage incorporation.
7. **HOW TO APPLY:**
   With: Aircraft or Ground equipment.
   Incorporation:
   Time: 1st incorporation within 24 hours, second incorporation can be either in the fall or spring.
   Implement: Use a double disc or light duty cultivator plus harrows. Harrowing does not provide effective incorporation if compacted soil prevents penetration of harrow teeth or if trash accumulates in harrow section or if harrows bounce.
   Rate:

Fall Granular Fortress Rates (kg/ac)

Crop	Less than 2% Organic Matter	2 - 4% Organic Matter	4 - 6% Organic Matter	Greater than 6% Organic Matter	Greater than 8% Organic Matter
Spring & durum wheat	- -	4.5	5.7	5.7	6.9
Barley	4.5	5.7	5.7	6.9	6.9
Rapeseed/flax/mustard	5.7	5.7	5.7	6.9	6.9

Spring Granular Fortress Rates (kg/ac)

Crop	Application Timing	Less than 2% Organic Matter	2 - 4% Organic Matter	4 - 6% Organic Matter	Greater than 6% Organic Matter	Seeding Depth (cm)
Spring & durum wheat	Before seeding	- -	- -	4.5	5.7	5-7.5
Barley		- -	4.5	5.7	6.9	5-7.5
Rapeseed/flax/mustard		5.7	5.7	6.9	6.9	as desired

8. **APPLICATION TIPS:** Calibrate equipment to deliver desired amount of product. Use only a hoe-drill or a double disc press drill to seed barley or wheat into a Fortress treated field. Do not apply to soil with less than 2% organic matter if it is to be seeded to wheat. Do not apply Fortress for wheat on land which has been treated with trifluralin since June 1 of the previous year.
   Seeding: Flax, mustard, and rapeseed can be seeded in treated layer. Barley and wheat are more sensitive and should be planted 6.0-7.5 cm. Wheat must be seeded at least 1.0 cm below the treated layer. Do not seed deeper than 7.5 cm. To ensure an even crop stand, increase the usual seeding rate of barley and wheat by 10%. Seed into warm, moist seedbed.
9. **HOW IT WORKS:** Absorbed by wild oat shoots and foxtail roots usually resulting in death before emergence. Under dry conditions, some wild oats and foxtail may emerge before being killed
10. **EXPECTED RESULTS:**
    Weeds: Wild oats and foxtail die before they emerge. Weed control may be reduced under conditions of prolonged, cool soil temperatures at the time of germination, or extreme drought in spring.
    Crops: Thinning in barley and wheat are known to occur under conditions of heavy rainfall and/or cold weather after application and before crop emergence. In most cases thinning is more than offset by tillering. Some thinning may be noted on eroded knolls. **Poor results may be expected if** there is incomplete incorporation due to wet, cloddy soil or heavy trash. Very dry soil conditions in spring or prolonged cool soil temperatures at time of germination. Ridges left by seeding may disrupt the treated layer and allow escapes.
11. **EFFECTS OF RAINFALL:** Moisture is required for activation. Rainfall of at least 1.5 cm within 2 weeks of application, in the spring, is required to ensure maximum performance.
12. **MOVEMENT IN SOIL:** Negligible.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not use treated crops for forage or hay prior to crop maturity.
    Succeeding Crops: Under normal conditions Fortress carry over will not harm crops grown in rotation. As a precaution domestic oats, sugar beets, creeping red fescue, and small-seeded grasses such as timothy, and canary seed should not be grown in rotation following a Fortress treated crop.

14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (greater than 5,000). May cause skin and eye irritation.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) to avoid getting chemical on skin or in eyes. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a dry place.

FREE FLOW (trifluralin)

United Agri Products
(Oilseeds, Special Crops and Barley)

1. **FORMULATIONS:** Granular; trifluralin 10.0%; 22.7 kg bag.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Canola (rapeseed) (including triazine tolerant) (8.9), flax (7.7), lentils (8.5), mustard (8.9), peas (canning, field) (8.9), soybeans*, sunflowers (8.9), fababeans (8.6)
   Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**

bluegrass, annual (8.6)	grass, barnyard (8.3)
bromegrass, downy (5.9)	knotweed
buckwheat, wild (8.3)	lamb's-quarters (8.0)
chickweed (7.1)	oats, wild (7.5)
cockle, cow (9.0)	pigweed (8.2)
darnel, persian	purslane (7.9)
foxtail [green, yellow (8.1)]	thistle, Russian (7.9)

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Free Flow is applied before the crop is planted and before weed emergence. It is incorporated thoroughly into the soil to provide herbicidal action that will control all susceptible weeds. Free Flow does not control susceptible weeds that have already emerged through the soil at the time of application. It only controls susceptible weeds as they germinate.
   Spring: Not recommended.
   Summer: Rapeseed, (canola), TTC canola, fababeans, flax. Between June 1 and September 1.
   Fall: Rapeseed, (canola), TTC canola, fababeans, flax, lentils, mustard, peas, sunflowers. Between September 1 and soil freeze-up.
7. **HOW TO APPLY:**
   With: Ground equipment. Do not apply by air.
   Incorporation: First incorporation in the same direction as application, within 24 hours of application. Second at right angles to the first. For maximum effectiveness, delay the second incorporation for 5 days. Both incorporations should be to the depth of 8-10 cm.
   Implements: Incorporate with disc implements or cultivators only. Deep tillage cultivators are not recommended. A tandem disc is recommended for the first incorporation. Disc implements should be operated at 6-10 km/h and cultivators at 10-13 km/h.

Rate:

		SANDY SOILS		LOAMS TO CLAY SOILS	
		ORGANIC MATTER			
		FREE FLOW			
		2-6%	6-15%	2-6%	6-15%
CROPS	**TIMING**	kg/acre	kg/acre	kg/acre	kg/acre
Canola (rapeseed) (including TTC)	Fall	4.5	5.7	5.7	5.7-6.9
	Summer	6.9	6.9	6.9	6.9
Mustard Peas (field, canning) Fababeans Sunflowers	Fall	4.5	5.7	5.7	5.7-6.9
Flax and Lentils	Fall	4.5	5.7	4.5	5.7-6.9
Flax and Fababeans	Summer	6.9	6.9	6.9	6.9

8. **APPLICATION TIPS:**

Land Preparation: Before applying Free Flow, ensure that all emerged and existing weeds have been eliminated through discing, cultivation or by chemical control. Free Flow can be applied to stubble or trashy soils; however, heavy trash soils should be thoroughly disced prior to application in order to allow product penetration into the soil surface. Ensure that all large soil clods are broken before application. If manure has been applied to the field, ensure that it is thoroughly mixed into the soil with at least two tillage operations prior to Free Flow application. If the field has been burned in order to remove crop residue (straw, trash, etc.) ensure that the field is tilled at least once prior to Free Flow application.

Note: Do not plow (Moldboard) land prior to Free Flow application.

Method of Application: Apply uniformly into the soil surface using a calibrated granular applicator. Using the equipment guidelines provided in the Free Flow label or by the equipment manufacturer adjust the applicator to provide the required amount of Free Flow. These guidelines should only be used as starting points for equipment calibration and each applicator should be checked frequently to ensure that the correct rate of Free Flow is being applied. Ensure that the Free Flow is applied uniformly to the entire soil surface and avoid concentration of granules in narrow bands, etc. Ensure that all soil clods and lumps are broken during incorporation. Avoid over application.

Note:

*On deep black and heavy textured soils it is recommended to prework the soil early in the spring to promote weed seed germination followed by another cultivation prior to seeding to destroy existing weed growth.

*Cultivators should only be used for Free Flow incorporation when soils are in good working condition.

Flax, Lentils: To ensure a firm seedbed and maintain a constant depth of planting, a shallow tillage in the spring is recommended. Seed into a warm (usually after mid May), moist, firm seedbed to a depth of 2-4 cm. Both incorporations should be done prior to soil freeze-up in the fall. A tandem disc, discer or field (vibrashank) cultivator is recommended for incorporating to 8-10 cm. For best mixing action, operate disc implements at 6-10 km/h; cultivators at 10-13 km/h. Deep tillage cultivators are not recommended.

9. **HOW IT WORKS:** Kills weed seedlings as they germinate. Inhibits cell division in the actively growing points of root and shoot.

10. **EXPECTED RESULTS:**

Weeds: Most weeds die before emerging. Weeds will exhibit swelling in the coleoptile region, stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture obtaining ability.

11. **EFFECTS OF RAINFALL:** No effect once trifluralin is incorporated into the soil.

12. **MOVEMENT IN SOIL:** None.

13. **GRAZING AND CROPPING RESTRICTIONS:** Normally, trifluralin carry over will not harm crops grown in rotation. As a precaution, oats, sugar beets, creeping red fescue, and small-seeded grasses such as timothy and canary seed should not follow a trifluralin treated crop. Drought conditions in the year of treatment may result in higher levels of trifluralin carry over into the next year. To avoid wheat injury, seed less than 7 cm deep into a warm, moist seedbed. Not intended for crops grown for forage or hay. Over-application caused by overlapping or improper calibration or non-uniform application may cuase crop injury. Applying to severely eroded knolls may also cause crop injury.

14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (greater than 5,000). In clean water, fish are very sensitive to trifluralin, but in runoff or muddy water, trifluralin binds to soil particles and large amounts can be tolerated by fish. Non-toxic to bees.

15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce skin and eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medial attention.

16. **STORAGE:** Do not store under direct sunlight. Do not store in granular applicator (24 hours maximum).

17. **RESISTANCE MANAGEMENT** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, HERITAGE**, TRIFLUREX, RIVAL, FREE FLOW and FORTRESS will not control trifluralin tolerant green foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use

of these products repeatedly in the same field, or use a separate herbicide application for control of trifluralin tolerant green foxtail.
Note: Similar products are Advance 10G, Rival, Treflan and Trifurex.

Special Use: Free Flow on **Barley only** - Fall application only, September 1 to soil freeze-up.
Weeds Controlled: Refer to Section 4 (above).
Incorporation: Refer to Section 7 (above).
Rate:

SOIL TEXTURE, SOIL ORGANIC MATTER AND SOIL ZONE

Light		**Medium or Heavy**	
All soils with 2 to 4% organic matter	All soil textures with 4 to 6% organic matter	Sand and Sandy Loam with 6 to 10% organic matter	Loam, Silt Loam, Silt, Silty Clay Loam, Clay Loam, Silty Clay and Clay with 6 to 10% organic matter
Brown, Dark Brown, Black and Grey Wooded Soil Zones	Brown, Dark Brown, Black and Grey Wooded Soil Zones	Brown, Dark Brown, Black Soil Zones	Black and Deep Black Soil Zones
3.4 kg/acre	4.5 kg/acre	4.5 kg/acre	5.7 kg/acre

Warning: Do not apply on soils with less than 2% organic matter. Do not apply on land treated with trifluralin products since June 1 of the previous year. Application to severely eroded knolls may result in reduced crop stand.

FUSILADE - 250 EC(fluazifop-butyl)/ FUSILADE II - 125 EC (fluazifop-P-butyl)

ICI Chipman

1. **FORMULATIONS:** Emulsifiable Concentrate; Fusilade 250; 250 g/L; 2 x 8 L plus 2 x 1 L Agral 90; Fusilade II; 125 g/L; 2x8 L.
2. **REGISTERED MIXES:** 2,4-DB (alfalfa, bird's-foot trefoil, red clover), Lontrel (All canola including T.T.C. and Rapeseed), Bladex (T.T.C. canola only), metribuzin (Lexone, Sencor)(potatoes), Poast (Fusilade 250 only) (canola, flax).
   Mix Instructions: Always add Agral 90 when Fusilade 250 is used alone. Do **not** add Agral 90 when tank mixed with other herbicides. Do not use Agral 90 for Fusilade II.
3. **CROPS:**

alfalfa* (8.8)	fescue, creeping red (seed)	ornamentals**	sugar beets (8.9)
canola (8.6)	flax (8.9)	potatoes (8.9)	sunflowers (9.0)
clover, red* (8.7)	onions	soybeans (8.9)	trefoil, bird's-foot* (7.4)

   ***Legumes for seed production. Do not graze or harvest for feed in year of treatment.**
   **See label text for full listing of plant species.
4. **WEEDS CONTROLLED:**
   Fusilade 250/Fusilade II at 250 mL/ac: Corn, volunteer.
   Fusilade 250/Fusilade II at 330 mL/ac: Barley (volunteeer, spring); darnel, persian; grass (barnyard, johnson); wheat (volunteer, spring).
   Fusilade 250/Fusilade II at 400 mL/ac: Grass (crab, witch); millet, wild proso; panicum, fall.
   Fusilade 250/Fusilade II at 570 mL/ac: Foxtail (green, yellow).
   Fusilade 250/Fusilade II at 800 mL/ac: Quackgrass (season long control)*.
   *Maximum rate of Fusilade 250 on canola is 400 mL/ac.
   Fusilade 250 (160 mL/ac) + Poast (210 mL/ac): Barley (volunteer, spring); foxtail, green; oats (wild, volunteer); wheat (volunteer, spring).
   *Add Assist or superior oil concentrate to this tank mixture at a rate of 0.5% v/v, applying 45 L/ac of water, for optimum spray coverage.
5. **WEEDS SUPPRESSED:** At lower rate, yellow and green foxtail. At 400 mL/ac quackgrass is suppressed.

6. **WHEN USED:** When weeds are small and actively growing.
   Corn (volunteer): prior to tillering.
   Foxtail (green, yellow): 2-4 leaf stage.
   Quackgrass (season-long control): 3-5 leaf stage; maximum 20 cm tall.
   Other grassy weeds: 2-5 leaf stage or prior to tillering.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Water Volume: 45-120 L/ac.
   Pressure: 200-300 kPa. Dense weed infestations 425 kPa.
   Rate:
   250 - 800 mL/ac: Maximum rate of Fusilade 250 on canola; 400 mL/ac.
   Agral 90 (for Fusilade 250 only): 1 L for every 1,000 L of spray solution (0.1% by volume).
8. **APPLICATION TIPS:** Application made to annual grasses that have tillered and are under moisture and/or temperature stress will not provide accpetable control. Apply 3 days before the use of any broadleaf herbicide. Rhizomes of quackgrass should be thoroughly fragmented by tillage (disc or cultivator) prior to application to obtain effective control. Crop competition generally enhances control of quackgrass. Do not cultivate for 5 days after applying.
9. **HOW IT WORKS:** Systemic, readily translocated from leaf surfaces to the growing points where it starts killing the grasses. Translocation also carries **Fusilade** to the roots and rhizomes to help prevent regrowth and add to the control of perennial grasses.
10. **EXPECTED RESULTS:** Grass growth stops in 48 hours. Young shoots turn brown in seven to eight days, and complete kill takes place over a three to four week period.
11. **EFFECTS OF RAINFALL:** No effect 2 hours after application.
12. **MOVEMENT IN SOIL:** No soil movement. This product will not leach in the soil.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not harvest alfalfa, red clover, bird's-foot trefoil or creeping red fescue for feed or graze livestock in the year of treatment.
    Minimum Interval to Harvest (days): Canola, Flax (80); Sugar beets, Potatoes, Soybeans (90); Sunflowers (120); Onions, Tomatoes (60); Strawberries (30).
    Succeeding Crops: Seed only broadleaf cr os listed on this label if it is necessary to reseed a crop within 60 days of applying Fusilade.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (4,770). May cause eye and severe skin irritation.
    Warning: Experimental feeding studies in rats have demonstrated that the active ingredient in this product can produce birth defects and other adverse effects in the developing fetus of rats. **Women capable of bearing children should be particularly careful when handling this product.** Occupational exposure to this product will be reduced by strict adherence to the handling precautions and use directions provided.
15. **PRECAUTIONS, FIRST AID:** Wear coveralls, boots, and PVC (liquid proof) gloves and safety goggles when handling the concentrate. When spraying, avoid spray mist by staying upwind from the spray and/or by wearing a suitable mask or respirator. Wash thoroughly with soap and water after handling and before eating or smoking. Remove contaminated clothing and wash before reuse. **If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention. **If swallowed** seek medical attention.
16. **STORAGE:** Not affected by freezing down to -20°C.

GARLON 4 (triclopyr)

DowElanco

CAUTION POISON

1. **FORMULATIONS:** Solution Garlon 4; 480 g/L; 10 L jug; 205 L drum.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Utility rights-of-way, fence rows, pipelines, power lines, communication lines, roadsides and rail road, industrial manufacturing and storage sites.
4. **WEEDS CONTROLLED:**

Brush:

alder
aspen
balsam poplar
birch
chokecherry
cottonwood
pine
poison oak
raspberry
tamarack
wild rose,
willow

Weeds:

burdock	smartweed
curled dock	smooth bedstraw
dandelion	wild lettuce
field bindweed	vetch
lamb's-quarters	

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Foliar applications: After foliage is well developed. Unsatisfactory results are likely if foliage has lost its normal color and/or texture.
   Basal Bark Applications: Any time the target zone of the stem and/or root collar can be clearly seen and treated.
7. **HOW TO APPLY:**
   With: Boom, Radi-arc, OC nozzles, handgun or backpack.
   Rate:
   Brush: 1.6-3.2 L/ac.
   Weeds: 0.4-1.6 L/ac.
   Water Volume: 100 L/ac or more.
8. **APPLICATION TIPS:** In broadcast application **Garlon 4** efficacy depends on uniform coverage. Higher application volumes (200 L/ac or more), depending on the application system, provide the uniformity of coverage desired. Do not contaminate water used for irrigation purposes. Avoid drift or overspray of vegetable crops, grapes or fruit crops.
9. **HOW IT WORKS:** Interferes with cell division and elongation; causing leaf cupping, stem distortion and eventual death. **Garlon 4** is absorbed through leaves and stems of susceptible plants.
10. **EXPECTED RESULTS:** Within 1 or 2 weeks of treatment leaves of treated vegetation display cupping and browning. Within first season smaller twigs and stems become brittle and die.
11. **EFFECTS OF RAINFALL:** Rain within 2 hours of **Garlon 4** application may cause poor results to occur.
12. **MOVEMENT IN SOIL:** Triclopyr is relatively strongly bound to organic carbon and clay colloids so movement with soil water is unlikely to occur.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze treated area with dairy animals within 1 year of treatment. No recropping restrictions exist for triclopyr used for industrial brush and weed control.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical triclopyr (713); **Garlon 4** (2460).
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx), plus rubber boots or overshoes if treated area is wet. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention immediately. Do not induce vomiting.
16. **STORAGE:** Store in a cool, dry place above -2°C. If stored below -2°C agitate before use.

GLEAN (chlorsulfuron)

DuPont

CAUTION POISON

1. **FORMULATIONS:** Dry Flowable; 75%; 500 g container.
2. **REGISTERED MIXES:** See Rate table for tank mix crops. Avenge 200-C/280, Avenge 640, 2,4-D (amine and ester), Hoe-Grass 284, Mataven, MCPA amine, Stampede 360.
   Surfactants: Ag-Surf, Agral 90, Citowett Plus, Super Spreader-Sticker, Triton XR.
   Mix Instructions: Add 1/2-3/4 required amount of water. While agitating, **add Glean and ensure it is completely suspended before adding tank mix herbicide**. Complete filling, then add surfactant **(if required).** Continuous agitation is required.
   Mix Restrictions: Do not allow spray mix to remain in the tank for more than 24 hours as effectiveness may be reduced.
3. **CROPS:** Barley (9.0), oats, wheat (9.0)(durum, spring, winter), non-crop areas.
   Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**

In Crops 6 g/ac when mixed with wild oat herbicide

cockle, cow (9.0)	lady's-thumb (9.0)	pigweed, redroot (8.5)	smartweeds, green (7.6)
flixweed (9.0)	lamb's-quarters (8.6)	rapeseed, volunteer (8.4)	stinkweed (8.1)
hemp-nettle (8.6)	mustard, wild (8.0)	shepherd's-purse (8.7)	stork's-bill

In Crops 6 g/ac when mixed with 2,4-D (amine or ester) (not to be used on oats)

All weeds controlled at 6 g/ac of Glean plus:

annual sunflower	kochia	pigweed, Russian	prickly, lettuce
buckwheat, wild	mustard, ball	plantain	sweet clover
narrow leaved hawk's-beard (spring seedlings only)			thistle, Russian

In Crops 6 g/ac when mixed with MCPA
All weeds controlled at 6 g/ac of Glean plus:

annual sunflower	kochia	plantain	
burdock	pigweed, Russian	prickly, lettuce	

In Non-crop Areas 16 g/ac: wild carrot
In Non-crop Areas 28 g/ac

carrot, wild	flixweed	stinkweed	thistle, Russian
clover, sweet	kochia	tansy, common	

In Non-crop Areas 49 g/ac

buckwheat, wild	clover,sweet	kochia	stinkweed
carrot, wild	dandelion	hawk's-beard,narrow-leaved	tansy, common
chamomile, scentless	flixweed	horsetail	thistle (Canada, Russian)

5. **WEEDS SUPPRESSED:**
In Crops 6 g/ac + 2,4-D (amine or ester): Canada thistle
In Non-Crop areas 28 g/ac: Canada thistle, dandelion, goldenrod, horsetail, perennial sow-thistle, wild rose.
In Non-crop areas 49 g/ac: Goldenrod, perennial sow-thistle, wild rose, wild strawberry, willow.

6. **WHEN USED:**
Barley, oats, wheat [durum, spring, winter (spring application)]: 2 leaf to flag leaf stage. When tank mixing with 2,4-D or MCPA apply from the 3-leaf to flag leaf stage.
Buckwheat: Actively growing buckwheat 1-3 leaf stage. Control may be reduced under dry conditions.
Non-crop areas: Post-emergence to young actively growing weeds. Do not apply to frozen ground or to soils saturated with water or during periods of heavy rainfall.
Weeds: Best results when less than 10 cm tall and actively growing.

7. **HOW TO APPLY:**
With: Ground equipment. Do **not** apply by air. **Chlorine bleach must be used to deactivate Glean when cleaning equipment.**
Sprayer Cleanup: To avoid injury to susceptible crops thoroughly clean sprayer immediately after spraying. Ammonia must be used to deactivate **Glean** when cleaning equipment.
1. Drain and flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to assure removal of all visible residues of **Glean**. If necessary, repeat Step 1.
2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water to completely fill tank. Allow to sit for 15 minutes with agitation. Again flush the hoses, boom and nozzles with the cleaning solution and drain tank.
3. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
4. Repeat Step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

Caution: Do **not** use ammonia with chlorine bleach. Using ammonia with chlorine bleach will release a gas with a musty chlorine odour which may cause eye, throat and lung irritation. Do **not** clean equipment in an enclosed area. Do **not** clean sprayer near well or water source or near to desirable vegetation.
Water Volume: Flat fan nozzles: 25 L/ac minimum; flooding fan nozzles: 91 L/ac. Non-crop area: 40 L/ac minimum; 80-160 L/ac preferred.
Pressure: 275 kPa
Nozzles: Flat fan types. Increased water volumes for flooding fans. 50 mesh screens or larger. Only metal or nylon filters.
Rate:

Crops	Glean g/ac	Tank Mix	Surfactant
Barley, oats, wheat, spring.	6	Glean alone	1 L/1000 L spray mix
Non-crop areas; selective control	28	Glean alone	as above
Non-crop areas; non-selective control	49	Glean alone	as above
Barley, Avenge wheat varieties.	6	Avenge 200-C at 1.72 L/ac	none
Barley, Avenge wheat varieties.	6	Avenge 640 at 525 g/ac	245 mL/ac
Barley (except Klages, Betzes), wheat (durum, spring, winter).	6	Hoe-Grass 284 at 1.1 L/ac	none
Only wheat (durum, spring).	6	Mataven L at 2.0 L/ac	none
Barley (only Argyle, Bedford, Klages), wheat (durum, spring).	6	Stampede 360 at 1.1 L/ac	1 L/1000 L spray mix
Wheat (spring, durum), oat, barley	6	2,4-D amine 500 at 340-450 mL/ac	1L/1000L spray mix
Wheat (spring, durum), oat, barley	6	2,4-D ester LV700 at 245-325 mL/ac	1L/100L spray mix
Wheat (spring, durum), oat, barley	6	MCPA amine 500 at 280-450 mL/ac	1L/1000L spray mix

8. **APPLICATION TIPS:** Higher spray volumes required for dense crop canopy and/or large weeds. Hoe-Grass 284 tank mix does not control green or yellow foxtail. Do not use on soils above pH 7.5. Do not apply to irrigated land. Do not exceed a total of 6 g/ac within a 12 month period on crop land. Clean equipment thoroughly after Glean or Glean mixes.

9. **HOW IT WORKS:** Absorbed by foliage and roots. Inhibits cell division. Under certain conditions such as heat, stress, or heavy rainfall immediately after treatment, temporary discolouration of crop may occur.

10. **EXPECTED RESULTS:**
Weeds: Growth stops almost immediately. After 7-10 days yellowing or purpling will occur followed by complete desiccation. Glean remains active in soil throughout the growing season controlling later germinating weeds. **Poor results may be expected if** improper mixing, timing, coverage or when weeds are under drought stress.
11. **EFFECTS OF RAINFALL:** Heavy rainfall immediately after application may cause temporary lightening of crop.
12. **MOVEMENT IN SOIL:** Movement is restricted by fine textured soils, soil organic matter and neutral to acidic conditions.
13. **GRAZING AND CROPPING RESTRICTIONS:**
Grazing Restrictions: Wheat, barley and oats may be grazed or fed to livestock any time after treatment.
Drift: Use extreme care to prevent drift onto desirable plants or non-target agricultural land.
Succeeding Crops: Recropping to barley, oats, wheat.

Minimum Recropping Intervals (months)

Soil pH*	Barley	Oats	Wheat (durum)	Wheat (spring, winter)
7.0 or lower	10	10	10	2
7.1 to 7.5	22	22	10	2

*Soil pH determined by 1:1 soil:water suspension method.

Succeeding Crops: Recropping to crops other than cereals

		Minimum Rotation Interval (Months)			
Soil pH	Soil Zone	Flax	Lentils	Peas	Rapeseed (canola)
7.0 or lower	Black or Grey Wooded (organic matter greater than 5%)	48	48	34	22
7.0 or lower	Brown or Dark Brown	NRR*	NRR	NRR	34
7.1 to 7.5	Black or Grey Wooded (organic matter greater than 5%)	NRR	NRR	34	34

*NRR-No Recommendation Registered.

Note: If rainfall is less than 250 mm in the Black or Grey Wooded, or 130 mm in the Brown or Dark Brown soil zones in any year between Glean application and planting of flax, lentils, peas, or rapeseed; extend rotation interval 1 year, unless a field bioassy confirms the absence of Glean residues. Unless soil pH, soil zone, crop or minimum rotation is as specified as above, the completion of a successful field bioassay is required before planting a crop in Glean treated soil. For crop rotation flexibility, do not use Glean on all of your crop land. If land has been treated with Glean and Assert the same year or in successive years, seed only wheat until a field bioassy demonstrates that other crops can be seeded.

14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (5,919).
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a cool, dry place.
17. **RESISTANCE MANAGEMENT:** To delay selection of resistant weeds, rotate the use of Glean, Ally, Muster and Refine with other herbicides that are also effective on the same weeds. Also, where appropriate, use tank mixtures of Glean and other herbicides, except Refine, Muster and Ally that are also effective on those weeds.

GRAMOXONE (paraquat)

ICI Chipman

DANGER POISON

1. **FORMULATIONS:** Solution; 200 g/L; 1, 4 X 5 L pack.
2. **REGISTERED MIXES:** Lexone, Lorox, Patoran, Sencor and 2,4-D.
Chemical Mowing of Non-Crop Areas: May be tank mixed with certain soil sterilants where immediate top kill and long-term sterilization are required.
3. **CROPS:** Asparagus, non-crop areas, potatoes, shelterbelts, stale seedbed (vegetables, field crops), sugar beets.
4. **WEEDS CONTROLLED:** All top growth. Generally kills annuals in 1 application. Repeat applications may be needed on perennials.
5. **WEEDS SUPPRESSED:** Most perennial weeds.
6. **WHEN USED:** Prior to crop emergence, but soon after weeds emerge.
Potatoes: Apply up to ground crack only for Netted Gem and Cherokee. Other varieties apply up until the first potato tops are 5-8 cm. Do not apply to emerged potato foliage in evening, or when potatoes are under moisture stress due to extremely dry soil conditions, or to early potatoes.
Stale Seedbed: Do not apply later than 3 days before crop emergence.
7. **HOW TO APPLY:**
With: Ground equipment only. Do not use mist blowers.

Rate:
Chemical Mowing: 1.1 L in 220-445 L/ac of water.
Non-Crop Areas: 2.2-4.5 L in 220-445 L/ac of water.
Potatoes: Quackgrass, annual grasses and broadleaf weeds: 1-1.75 L in 120-220 L/ac of water; emerged seedlings thereof: only 610 mL in 120-220 L/ac of water.
Note: Application to exposed or emerged potato foliage will cause temporary injury and chlorosis. Use of poor or diseased seed and cut seed with 1 eye will make potatoes more susceptible to injury by post-emergence sprays. Will not control weeds that germinate after treatment.
Shelterbelts: 2.2 L in 445 L of water/ac or 75 mL in 10 L of water/100 m^2. 550 mL of this mixture will treat an area 1.75 mm diameter around a tree. Keep chemical off the foliage of trees.
Stale Seedbed Technique (Vegetables, Field Crops): Beans (all types), beets, carrots, cole crops, corn, cucumbers, onions, peas, potatoes, soybeans, turnips. Prepare a seedbed at least 2-4 weeks before seeding to stimulate weed growth. Seed with minimum soil disturbance. Burn-off of emerged weeds: 1.1-2.2 L in 120-445 L of water/ac before or after seeding. Weeds above 5 cm tall: 2.2 L/ac.
Water Volume: 120-445 L/ac. Thoroughly wet all foliage. For dense weed growth use the greater volume of water.
Incorporation: Not applicable.
Pressure: 300 kPa.

8. **APPLICATION TIPS:** Use only clean water to avoid reduction in effectiveness. Use high volume, low pressure type spraying equipment to thoroughly cover foliage. Special equipment is necessary to shield some row crops from spray. Applications on cloudy days, or just prior to or during periods of darkness will generally increase effectiveness of the treatment. Thoroughly wash equipment after spraying - use a wetting agent (Agral 90 at 60 mL/100 L of water), flush and spray out, then thoroughly rinse with clean water. Fill with clean water and leave overnight, then spray out.
9. **HOW IT WORKS: Gramoxone** is a contact type herbicide, therefore, good spray coverage is essential. It is absorbed by all leaf and stem surfaces and is non-systemic. It interferes with photosynthesis.
10. **EXPECTED RESULTS:** Provides immediate, fast and virtually complete annual weed kill from 1 application. Repeat applications may be necessary for perennial weeds. Yellowing occurs within a few hours and desiccation of the plant continues rapidly until death.
11. **EFFECTS OF RAINFALL:** Rain prior to spray solution drying on plant, or muddy water will reduce effectiveness of the chemical. Once spray solution has dried on plant tissue, rain will not reduce effectiveness.
12. **MOVEMENT IN SOIL:** Binds to the soil and becomes biologically unavailable. No residual effect.
13. **GRAZING AND CROPPING RESTRICTIONS:**
Drift: Prevent drift onto crops, ornamentals, lawns, grazing areas, or other desirable areas.
Grazing Restrictions: Not applicable.
Crop Use After Hail: No restriction.
Succeeding Crops: No restriction.
14. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = paraquat ion (120-150). Symptoms of acute poisoning may occur.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx), rubber gloves, approved face mask, and eye shield. **Keep out of reach of children and animals. If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. **Intake can cause heart, liver and kidney damage and can be fatal. It can be absorbed through the skin.**
16. **STORAGE:** Heated storage preferred. Will crystallize if frozen. **Never** transfer to other containers.

HERBICIDE 273 (endothall)

Atochem North America

DANGER POISON

1. **FORMULATIONS:** Herbicide 273 is a 360 g/L liquid available in 18.2 litre containers.
2. **REGISTERED MIXES:** Betamix, Betanex.
Mix Instructions: Fill spray tank with 1/2 amount of water. With agitator running, add Herbicide 273 followed by other herbicide for tank mix. Add remaining water.
3. **CROPS:** Sugarbeet.
4. **WEEDS CONTROLLED:**
Pre-emergent with high moisture: barnyard grass, green foxtail, red-root pigweed.
Postemergence application: lady's thumb, wild buckwheat.
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Post-emergence: 4-6 leaf stage of the crop.
7. **HOW TO APPLY:**
With: Ground equipment.

Rate:

a. **Band treatment** (56 cm row spacing).

Band Width (cm)	Litres/ac
15	0.4-0.5
20	0.4-0.7
25	0.6-0.8

-Use lower rate on light, sandy soils.

b. **Broadcast treatment** - 0.9 to 1.9 L/ac in 36-110 L of water.

c. Tank mixes (post-emergence only, 56 cm row spacing band).

Broadcast	Band (L/ac)	Width (cm)	Litres/ac
Herbicide 273	0.6-1.3	15	0.1-0.3
		20	0.2-0.4
		25	0.2-0.6
Betamix	2.8	15	0.8
		20	1.1
		25	1.3
Betanex	2.8	15	0.8
		20	1.1
		25	1.8

8. **APPLICATION TIPS:** As a post-emergence treatment, do not apply later than 60 days after emergence. Some temporary marginal leaf burn may occur under adverse conditions but recovery is normally rapid. For best results apply when average temperature is above 20°C.
9. **HOW IT WORKS:** No information available.
10. **EXPECTED RESULTS:** No information available.
11. **EFFECT OF RAINFALL:** No information available.
12. **MOVEMENT IN SOIL:** No information available.
13. **GRAZING AND CROPPING RESTRICTIONS:** Will not interfere with normal crop rotation.
    Grazing restrictions: No information available.
14. **TOXICITY:** Acute oral LD_{50} (rat) 125 mg/kg. Acute dermal LD_{50} (rabbit) 10,000 mg/kg.
15. **PRECAUTIONS AND FIRST AID:** Wear goggles, rubber gloves, rubber boots, overalls, rubber apron and respirator when handling. Wear standard protective clothing (see page xx) and goggles to reduce the skin and eye contact. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Keep from freezing.

HERITAGE 5G/ADVANCE 10G (trifluralin)

DowElanco

Wheat - Brown Soil Zones Only

1. **FORMULATIONS:** Heritage Granular; 5%; 25 kg bag and 725 kg returnable bulk bag. Advance Granular; 10%; 22.7 kg bag and 454 kg returnable bulk bag.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Wheat (durum, spring)(8.6).
   Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**
   Fallow Year:

barnyard grass (8.3)	darnel, Persian	oats, wild (7.5)
buckwheat, wild (8.3)	foxtail, green (8.1)	pigweed, redroot (8.2)
cockle, cow (9.0)	lamb's-quarters (8.0)	thistle, Russian (7.9)

   Crop Year: Green foxtail, lamb's-quarters.
5. **WEEDS SUPPRESSED:**
   Crop Year: Wild buckwheat, wild oats.
6. **WHEN USED:** Apply to summerfallow in May, June and July for weed control during both years of a summerfallow-wheat rotation. Maximum benefit comes when applied as early as possible in the fallow year. **Also see Special Use below.**
7. **HOW TO APPLY:**
   With: Ground equipment with granular applicator.

Rate:	May	June (kg/ac)	July
1-3% Organic Matter - Heritage	7.7	6.5	5.3
- Advance 10G	3.8	3.2	2.6
4-8% Organic Matter - Heritage	8.9	7.7	6.5
- Advance 10G	4.5	3.8	3.2

Brown Soil Zones Only.
Incorporation: If green growth prevents proper mixing, it must be destroyed before application. Apply over standing or pre-worked stubble, provided straw is chopped and evenly distributed. Incorporate within 24 hours of application to 5-8 cm with cultivator (field or deep tillage) at 10-13 km/h or disc at 7-10 km/h. Second incorporation at the same depth and right angles to first. Repeat when necessary to control resistant weeds in fallow year. Cultivation with a rodweeder or shallow tillage cultivator may be required. Do not cultivate when soil is crusted, lumpy or too wet for good mixing action. Working deeper than 8 cm can result in erratic weed control and crop injury.

8. **APPLICATION TIPS:** Do not apply on soils subject to prolonged flooding, sandy soils with less than 1% organic matter, soils with more than 8% organic matter, soils in poor working condition. Application to severly eroded knolls may result in reduced crop stands. In the fall, prior to application, spread straw evenly over field and leave stubble standing to trap snow. For maximum effectiveness apply in May. After filling granular applicator, close lid quickly to avoid exposure to direct sunlight. In crop year, after application and when soil is warm enough for good germination, prepare seedbed with field cultivator set at 5 cm deep. Seed into a weed-free seedbed, 3-6 cm deep, using double disc or hoe drill. Separate spring tillage may not be necessary with a discer or airseeder. Pack or harrow after seeding. Drought conditions in fallow year, prior to seeding, may result in higher carry over of Heritage at seeding time. To reduce possible injury by carry over, seeding to the correct depth (3-6 cm) is critical.
9. **HOW IT WORKS:** Seedlings are killed during germination by inhibited cell division at active growing points. This results in puffy, brittle, slow growing shoots and swollen brittle root tips. Established weeds are not controlled.
10. **EXPECTED RESULTS:**
Weeds: After first incorporation, susceptible weeds are partially controlled. After second operation, susceptible weeds are controlled before emergence.
Crop: No injury to wheat, after summerfallow. Over-application caused by overlapping, improper calibration, non-uniform application, etc. may reduce crop stand, delay development or reduce yields.
11. **EFFECTS OF RAINFALL:** No effect once incorporated into the soil.
12. **MOVEMENT IN SOIL:** None.
13. **GRAZING AND CROPPING RESTRICTIONS:** Not intended for crops grown for forage or hay.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (10,000). Non-toxic to bees. Very toxic to fish. Large amounts of Heritage can be tolerated by fish in runoff or muddy water because it binds to suspended soil.
15. **PRECAUTIONS, FIRST AID:** Highly flammable. May explede if heated. Wear standard protective clothing (see page xx) to reduce exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake can cause heart, liver and kidney damage. A small amount of vomited liquid inhaled can be fatal.
16. **STORAGE:** Store in areas not exposed to high temperatures, prolonged direct sunlight or moisture.
17. **RESISTANCE MANAGEMENT:** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, HERITAGE**, TRIFLUREX, RIVAL, FREE FLOW and FORTRESS will not control trifluralin tolerant green foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use of these products repeatedly in the same field, or use a separate herbicide application for control of trifluralin tolerant green foxtail.

Special use: Wheat [durum, spring (including semi-dwarf)] - **Fall application only. (September 1 to soil freeze-up).**
Weeds Controlled: Green Foxtail.
Incorporation: (as above) First incorporation within 24 hours of application, 5-8 cm deep. Second incorporation at same depth and right angles to first, in the fall at least 3 days later or in the spring during seedbed preparation.
Rate: Heritage - 4.5 kg/ac. Advance 10G - 2.25 kg/ac.

HOE-GRASS II (diclofop-methyl + bromoxynil)

Hoechst

1. **FORMULATIONS:** Emulsifiable Liquid; 230 g/L diclofop-methyl + 80 g/L bromoxynil; 20 L container.
2. **REGISTERED MIXES:** Decis: barley (except Betzes, Klages), flax, wheat. MCPA (Amine or Ester)(**only 28 mL/ac**): barley (except Betzes, Klages), spring rye, triticale, wheat.
Caution: Do not exceed, under any circumstances, the recommended amount of MCPA as a severe reduction in grassy weed control will result.

3. **CROPS:** Barley (8.4)(except Betzes, Klages), flax (7.6), rye (spring) (9.0), triticale (9.0), wheat [durum (8.8), spring (8.7)].
Seeding Grasses (Seed Production only): Bromegrass; fescue, creeping red; ryegrass, Russian wild; wheatgrass (crested intermediate).
Underseeding: Do not treat crops underseeded to legumes.

4. **WEEDS CONTROLLED:**

barnyard grass (9.0)	cocklebur, cow (7.9)	knawel	oats, wild (7.4)
buckwheat	corn, volunteer (8.4)	kochia (8.2)	pigweed, redroot (7.2)
tartary (7.2) wild (8.0)]	darnel, Persian (6.9)	lady's-thumb	smartweed, green (8.8)
catchfly, night-flowering (8.8)	foxtail [green (7.4), yellow]	lamb's-quarters (7.0)	stinkweed (8.2)
chamomile, scentless (8.7)	groundsel, common (9.0)	mustard, wild (8.3)	thistle, Russian (8.2)

5. **WEEDS SUPPRESSED:** None.

6. **WHEN USED:**
Weeds: Barnyard grass, foxtail, wild oats: 1-4 leaf. Persian darnel: 1-3 leaf. Volunteer Corn: 15-25 cm. Broadleaf weeds: seedling - early 4 leaf. Russian Thistle: seedling - 5 cm tall.
Crops:
Barley (except Betzes, Klages): 1-4 leaf and prior to tillering. Application beyond the 4 leaf stage or after tillering will result in crop damage.
Flax: 5-10 cm in height. During periods of stress [for example, very hot (28°C or 82°F)] or high humidity, flax may show leaf burn, retarded growth and a slight maturity delay. Avoid spraying flax under these conditions. Early evening spraying has been shown to be best.
Wheat: No leaf stage restriction.
Grasses: 2-5 leaf stage.

7. **HOW TO APPLY:**
With: Ground equipment only. Do not apply by air.
Rate: 1.4 L/ac.
Water Volume: 45 L/ac.
Pressure: 275 kPa.
Nozzles: Only flat fan nozzles recommended.

8. **APPLICATION TIPS:** For best results and maximum yield enhancement, apply when majority of weeds are in the 2-3 leaf stage. During periods of stress, plants are not actively growing. When daytime temperatures are very hot (28°C or 82°F) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Hoe-Grass during these periods may result in substantially reduced control. Under these conditions, yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. Good spray coverage and penetration may be difficult if weed populations are extremely high. Apply the spray at a forward angle of 45° and ensure that weeds are young and actively growing. Hoe-Grass II must be applied at least 4 days before the use of any other herbicide to eliminate a reduction of control.

9. **HOW IT WORKS:** Diclofop-methyl possesses contact as well as systemic action. Uptake is primarily through the leaves. The site of action is the growing point. Bromoxynil is primarily a contact herbicide with limited translocation in susceptible annual broadleaf weeds.

10. **EXPECTED RESULTS:** Yellowing of susceptible plants are visible within 2-4 days. New leaf growth exhibits light chlorosis which deepens and browning develops within 10-14 days of application. Photosynthesis and growth are inhibited and uptake of water and nutrients ceases. Lack of adequate crown root development is 1 of the most distinguishable features of diclofop-methyl activity. Bromoxynil activity is evident within 24 hours as necrotic spots appear on the leaves of susceptible broadleaf weeds. This damage spreads rapidly until the plants ultimately die. Chlorosis may develop in the untreated leaves of these susceptible weeds even though very little movement of the bromoxynil occurs.
Precautions:
Barley: Under certain environmental conditions, yellow blotches may appear on the barley leaves. These blotches will be rapidly outgrown and will not affect maturity or yield.

11. **EFFECTS OF RAINFALL:** Rainfall within 1 hour will decrease activity.

12. **MOVEMENT IN SOIL:** Some movement may occur if sufficient moisture is present.

13. **GRAZING AND CROPPING RESTRICTIONS:**
Drift: Avoid treatment near susceptible crops.
Grazing Restrictions: Do not graze treated field prior to harvest. Do not use treated field for green forage. Do not apply Hoe-Grass II within 60 days of harvest.
Succeeding Crops: No restriction.

14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (2,350). Eye irritant. Toxic to fish.

15. **PRECAUTIONS, FIRST AID:** A small amount of vomited liquid inhaled can be fatal. May cause burns to the skin and eyes. Wear chemically resistant nitrile gloves (e.g. Edmont SOL-VEX #37-155/37-195 or PIONEER A-15). Wear protective clothing (see page xx) plus goggles to reduce eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.

16. **STORAGE:** Do not store below freezing. If stored for 1 year or longer, shake well before using.

HOE-GRASS 284 (diclofop-methyl)

Hoechst

DANGER CORROSIVE

1. **FORMULATIONS:** Emulsifiable Liquid; 284 g/L; 20 L pail.
2. **REGISTERED MIXES:** Glean (6 g/ac only) [barley*, wheat (durum, spring, winter)]. Lontrel (405 mL/ac only)(canola). Pardner [barley*, flax, wheat (durum, spring)]. Decis [barley*, canola, flax, mustard, potatoes, wheat (durum, spring, winter)]. Refine (8 g/ac only) [barley*, wheat (durum, spring, winter)].
   Note: *Barley (except Betzes or Klages).
   Mixing Restrictions: Use Glean mix for control of various broadleaf weeds and **wild oats only.** Do not use surfactants in Glean mix. Mixing with any broadleaf herbicide other than those registered on the Hoe-Grass 284 label will result in a reduction of grassy weed control. Use Refine mix for control of various broadleaf weeds and **wild oats only**. Do not use surfactants in Refine mix.
3. **CROPS:**

barley (8.2)(except Betzes, Klages)	fababeans (9.0)	soybeans (8.8)	**Forages, only in year of establishment**
beans, dry common (8.8) (only black, pinto, white)	flax (8.9)	sugar beets (8.5)	alfalfa (8.5)
beans, snap	lentils (8.4)	sunflowers (8.6)(except Corona)	alsike clover**
buckwheat, tame (8.6)	mustard, tame (8.9)	triticale (8.5)	bromegrass (7.5)
canola (8.9)	onion, dry bulb (8.6)	wheat, spring (8.5)	clover (red, sweet) (8.0)
carrots	peas (field, processing) (9.0)	wheat (durum, winter) (8.9)	fescue, creeping red (7.9)
	potatoes (8.7)		ryegrass, Russian wild (7.6)
	rye [fall (9.0), spring (8.7)]		sainfoin**
			wheatgrass [crested (7.3), intermediate]

   **Seeding legumes for seed production only.
4. **WEEDS CONTROLLED:** Wild oats (7.7), foxtail [green (7.6), yellow], barnyard grass (8.0), Persian darnel (6.8), volunteer corn (8.4).
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Weeds: Barnyard grass, foxtail, wild oats: 1-4 leaf. Persian darnel: 1-3 leaf. Volunteer corn: 15-25 cm.
   Crops:
   Barley: 1-4 leaf, prior to tillering.
   Forages: Only in year of establishment; cannot use for food or feed.
   Wheat: No leaf stage restriction.
7. **HOW TO APPLY:**
   With: Aircraft or Ground equipment. Do not use controlled droplet application equipment.
   Rate: 1.0-1.13 L/ac.
   Beans, carrots, fababeans, onions, potatoes, soybeans, sugar beets: 1.4 L/ac.
   Wild oats in 4-6 leaf stage: 1.1 L/ac.
   When tank mixing: 1.13 L/ac, except with Decis 1.0-1.13 L/ac.
   Water Volume: Air: 14 L/ac minimum. Ground: 45 L/ac.
   Pressure: Air: 300 kPa. Ground: 275 kPa.
   Nozzles: Only flat fan recommended.
8. **APPLICATION TIPS:** Do not use on Betzes and Klages barley. When tank mixing with bromoxynil do not delay Hoe-Grass 284 application if grassy weed is in correct stage. Reduced control can be expected if Hoe-Grass 284 is applied to weeds growing under stress. Control may be further reduced if tank mixed. Apply at least 4 days before any broadleaf herbicide, except bromoxynil products, to eliminate a reduced grass kill from Hoe-Grass 284. Not recommended to apply Hoe-Grass 284 after a broadleaf herbicide. During periods of stress, plants are not actively growing. When daytime temperatures are very hot (28°C or 82°F) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Hoe-Grass during these periods may result in substantially reduced control. Under these conditions, yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. Good spray coverage and penetration may be difficult if weed populations are extremely high. Apply the spray at a forward angle of 45° and ensure that weeds are young and actively growing.
9. **HOW IT WORKS:** Contact as well as systemic action. Uptake primarily through leaves and translocated to growing point. Penetration and uptake via roots may occur if soil is sufficiently moist and the rate of application is relatively high.
10. **EXPECTED RESULTS:** Yellowing of susceptible plants is noticeable within 2-4 days of application. New leaf growth exhibits light chlorosis which deepens and browning develops 10-14 days after application. Photosynthesis and growth are inhibited and uptake of water and nutrients ceases. Lack of adequate crown root development is evident on wild oats as well as in some sensitive barley varieties.
11. **EFFECTS OF RAINFALL:** Rainfall within 1 hour will decrease activity.
12. **MOVEMENT IN SOIL:** Some movement in soil if sufficient moisture is present.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Drift: Danger from drift is low.

Grazing Restrictions: Do not graze treated green crop. Do not apply within 60 days of harvest.
Succeeding Crops: No restriction.

14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (2,235). Toxic to fish. Non-toxic to birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce skin and eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. A small amount of vomited liquid inhaled can be fatal.
16. **STORAGE:** Do not store below freezing. If stored 1 year or longer, shake well before using.

HYVAR X (bromacil)

DuPont

1. **FORMULATIONS:** Wettable Powder; Hyvar X; 80%; 2 kg, 25 kg bags. Water Soluble Liquid; Hyvar X-L; 240 g/L; 4 L, 10 L jugs.
2. **REGISTERED MIXES:** None.
   Mixing Instructions: Hyvar X: Weigh out proper amount of Hyvar X and mix into necessary volume of water (minimum 20 L/kg of Hyvar X). Agitate continuously by mechanical or hydraulic means.
3. **CROPS:** Non-crop areas only. Total vegetation control.
4. **WEEDS CONTROLLED:** A non-selective, total vegetation control chemical for weeds, grasses and some brush.
5. **WEEDS SUPPRESSED:** Not applicable
6. **WHEN USED:** Just before or during the period of active growth of weeds. Do not apply when ground is frozen.
   Brush: Apply in spring or summer as a basal (spot) treatment.
7. **HOW TO APPLY:**
   Hyvar X-L
   With: Power sprayer. Handguns, backpack sprayers or a watering can may be used to treat small areas.
   Rate:
   Initial Treatment: Apply 12-18 L/ac. Higher dosage on soils containing 5% or more organic matter, or soils high in clay content.
   Retreatment of Regrowth: 7-9 L/ac.
   Small Areas: 450 mL/100 m^2.
   Brush Control: Spot Treatment Undiluted: At 8 mL/m of tree height up to 3 m. Four or five 8 mL deposits around the root collar for brush taller than 3 m with a spot gun. Spot Treatment Diluted: mix 1 L in 5 L of water, apply in 55 mL deposits with a spot gun.
   Hyvar X
   With: Same as Hyvar X-L, except more efficient agitation of the spray solution is required.
   Rate:
   Initial Treatment: 3-5 kg/ac. Use the higher dosage on soils containing 5% or more organic matter, or soils high in clay content.
   Retreatment of regrowth: 1.5-2.7 kg/ac.
   Small areas: 135 g/100 m^2.
   Brush Control: Mix 870 g Hyvar X in 10 L of water and apply 30-60 mL/stem 5-10 cm in basal diameter. Wet base of stem to point of runoff.
   Water Volume: 100-1000 L/ac. Use enough water to uniformly cover the area to be treated. Hyvar X-L: With a handgun apply 650 L of spray solution/ac. Hyvar X: Minimum of 20 L of water/kg of Hyvar X.
   Nozzles: Screens should be 50 mesh or larger.
8. **APPLICATION TIPS:**
   Weed Control: If dense growth is present, results will be improved if vegetation is removed before treatment. **Do not apply to slopes as soil erosion may occur.** Do not apply to brush standing in water, lawns, walks, driveways, tennis courts, or similar areas. Applying, draining or flushing equipment too near feeding roots of susceptible vegetation may cause injury. Thoroughly clean all traces of Hyvar from application equipment immediately after use.
9. **HOW IT WORKS:** Hyvar X is readily absorbed through the roots but much less readily through the leaves. Once in the plant it inhibits photosynthesis.
   Caution: Do not apply closer than 1.5 times the height of desirable vegetation.
10. **EXPECTED RESULTS:** Susceptible plants become chlorotic and then die. Vegetation kill is faster with higher rainfall. Degree and duration of control depends on amount of chemical applied, soil type, rainfall, and other conditions. Brush: final kill may not take place until the year following treatment. **Poor results may be expected if** weed growth too mature or if there is insufficient rainfall.
11. **EFFECTS OF RAINFALL:** Rainfall will carry the chemical into the root zone where it is absorbed.
12. **MOVEMENT IN SOIL:** Movement in soil is dependent upon soil type and soil moisture. Bromacil will move faster in a vertical direction in sandy soils than in soils high in organic matter or clay content. Movement can be severe on slopes.

13. **GRAZING AND CROPPING RESTRICTIONS:**
Drift: All crops and ornamentals may be injured by chemical drift. Do not apply in areas subject to severe soil erosion.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (5,200). Toxic to fish.
15. **PRECAUTIONS, FIRST AID:** Hyvar X-L is combustible. While applying undiluted product, do not smoke and keep away from heat and open flame. Intake of Hyvar X-L can cause damage to lungs, liver, heart and kidney and lead to a coma. May also cause blindness.Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Hyvar X: Store in a cool dry place. Hyvar X-L: Combustible, keep away from heat or open flame. Do not allow to freeze.

IPCO GRANULAR SOIL STERILANT

(sodium metaborate tetrahydrate+sodium chlorate+diuron)
IPCO

1. **FORMULATIONS:** Dry granule, 66.5% sodium metaborate tetrahydrate + 30% sodium chlorate + 1.25% diuron; 1 kg, 4 kg, 22.7 kg bags.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Non-crop areas; where long term, total vegetation control is desired.
4. **WEEDS CONTROLLED:** All growth. Annual broadleaf weeds and grasses. Perennial weeds.
5. **WEEDS SUPPRESSED:** Not applicable.
6. **WHEN USED:** In early spring when weeds are small, up to 15 cm tall, or in fall when weeds are dormant.
7. **HOW TO APPLY:**
With: Shaker can, mechanical spreader or knapsack sprayer.
Rate:
Annual weeds: 0.5-1 kg/10 m^2 - for dry application apply when rain is expected or water in.
Persistent perennial weeds: 1-2 kg/10 m^2 - either at maturity of weed or on damp soil in spring. Use higher rates on deep rooted perennials.
8. **APPLICATION TIPS:**
Limitations
Do not apply in hot, dry weather.
To avoid fire hazard from dead and dry vegetation, treat when weeds are small. If growth is well advanced, mow and rake before treatment.
Do not apply on or near desirable plants or on areas into which their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots.
Dried chemical residue on organic matter can be explosive.
Spray solution will damage leather.
9. **HOW IT WORKS:** Kills through contact action. Persists in the soil and provides prolonged control of germinating seedlings and regrowth from perennial roots. Length of control depends on: species, rate, soil type, rainfall, vegetation cover, and time of application.
10. **EXPECTED RESULTS:** Seedlings are controlled quickly. Slower kill on perennial weeds.
11. **EFFECTS OF RAINFALL:** Rainfall will move the chemical into the soil and enhance its activity. In areas of high rainfall or sandy soils, the residual effect is reduced due to leaching.
12 **MOVEMENT IN SOIL:** Limited.
13. **GRAZING AND CROPPING RESTRICTIONS:** Treated area will be rendered more or less unproductive for 1 or more years.
14 **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (2,300-3,500). May cause irritation of eyes, nose, throat and skin.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in cool, dry place. Avoid direct contact with ground or concrete floors when storing.

KARMEX (diuron)

DuPont

1. **FORMULATIONS:** Wettable Powder; 80%; 2 kg, 25 kg packs, Dry flowable; 80%; 2 kg, 25 kg packs.
2. **REGISTERED MIXES:** None.
   Mixing Instructions: Agitate continuously by mechanical or hydraulic means.
3. **CROPS:** Asparagus; irrigation and drainage ditches, ponds, dug-outs and spot treatment for general weed control. Non-crop areas.
4. **WEEDS CONTROLLED:** Broadleaf and grassy weed seedlings.
5. **WEEDS SUPPRESSED:** Not applicable.
6. **WHEN USED:** May be used at any time, except when the ground is frozen. Best results obtained when applied shortly before weed growth begins. Dense weed growth should be removed first then treatment applied. Sufficient rainfall or irrigation is necessary following treatment to carry the chemical to the root zone.
   Asparagus (established): No earlier than 4 weeks before spear emergence and no later than the early cutting period.
   Irrigation and Drainage Ditches: Before expected seasonal rainfall, if possible when soil in the ditch is still moist. Apply during the non-crop season when the ditch is not in use.
7. **HOW TO APPLY:**
   With: Field sprayer, hand sprayer, back-pack or sprinkling can.
   Rate:
   General Weed Control: Sandy or sandy loam soils 5.8-11 kg/ac. Clays or high organic soils 16-22 kg/ac. Use the lower rate when annual weed growth predominates and where only one season's control is desired.
   Retreatment of Regrowth: Annuals and seedlings 500 g/ac.
   Irrigation and Drainage Ditches: 250-750 g/100 m^2 or 9.3-27 kg/ac. Flush once before using for irrigation purposes. Karmex must be fixed in the soil by moisture to minimize movement in irrigation water.
   Spot Treatment: Couch grass, toadflax 0.75-1.0 kg/100 m^2.
   Small Areas: 50 g/10 m^2 is equal to 20.2 kg/ac.
   Water Volume: Use 100-160 L of water/acre to provide thorough, uniform coverage.
   Nozzles: Screens should be 50 mesh or larger.
8. **APPLICATION TIPS:** Do not use on sand, loamy sand, or gravelly soils with less than 1% organic matter. Spray booms must be shut off while starting, turning, slowing, or stopping as injury to the crop may result. Do not apply to newly seeded asparagus or to young plants during the first growing season after setting or on plants with exposed roots as severe injury may result. **Do not apply to slopes as soil erosion may occur.** Applying, draining or flushing equipment too near feeding roots of susceptible vegetation may cause injury. Do not use on lawns, walks, driveways, tennis courts, or similar areas. Thoroughly clean all traces of Karmex from application equipment after use.
9. **HOW IT WORKS:** Diuron is readily absorbed through the root system and less readily absorbed through stem and foliage.
10. **EXPECTED RESULTS:** Susceptible plants become chlorotic soon after treatment and then die. Degree of control and duration of effect will vary with the amount of chemical applied, soil type, rainfall, and other conditions. Regrowth of plantain, thistle, or wild carrot will indicate that retreatment is necessary. **Poor control may be expected** if inadequate rate or weeds too old or insufficient rainfall.
11. **EFFECTS OF RAINFALL:** Rainfall will activate the chemical, carrying it into the root zone.
12. **MOVEMENT IN SOIL:** Diuron absorbs readily to the soil and there is little movement by leaching.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Drift: All crops and ornamentals may be injured by chemical drift.
    Succeeding Crops: Do not replant treated areas to any crop within 2 years after last treatment as injury to subsequent crops may result.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (3,400). Non-toxic to birds and fish.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xx/x). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a cool dry place.

KERB 50W (propyzamide)

Rohm and Haas

1. **FORMULATIONS:** Wettable Powder; 50%; 2.0 kg bags. Order directly from Rohm and Haas.
2. **REGISTERED MIXES:** None specified.
3. **CROPS:** Alfalfa (established) (8.7), bird's-foot trefoil (established), grass (established), pastures (grass/legume).

4. **WEEDS CONTROLLED:**

barley [foxtail (7.5), volunteer]	most annual grasses (8.3)	orchard grass (6.3)	timothy
chickweed (8.2)	oats, wild (5.9)	quackgrass, seedling (7.4)	wheat, volunteer

5. **WEEDS SUPPRESSED:** None.

6. **WHEN USED:**
Fall: Alfalfa, bird's-foot trefoil. Apply between October 1 and freeze up. Best results are obtained when soil temperature is low but above freezing and soil moisture is high.
Spring: Alfalfa (grown for seed). For optimum control, the soil temperature should be cool.

7. **HOW TO APPLY:**
With: Ground equipment only.
Rate:

	g/ac
Fall	
Alfalfa, bird's-foot trefoil (established)	
- annual grasses, volunteer grain, wild oats	710
- quackgrass, orchard grass, timothy, chickweed	910-1310
Pasture (established)- Brown, Dark Brown, Grey Wooded soils	275-365
- Thin Black or Black soils	365-495
Spring	
Alfalfa (grown for seed)	
- annual grasses, volunteer grain, wild oats	710 (maximum)
- quackgrass, orchard grass, timothy, chickweed	910 (maximum)

Water Volume: 40-200 L/ac.
Incorporation: None. Spring application on alfalfa, if soil temperature is high and moisture content low, a light incorporation is recommended.
Pressure: 275 kPa.
Nozzles: Flat fan, 50 mesh or larger metal filters and nozzle screens.

8. **APPLICATION TIPS:** Do not use on highly organic peat or muck soils. Avoid application to timothy, fescue, or perennial bluegrass. In fall, rain in 1 or 2 days, or a light overhead irrigation (1.25-2.5 cm) improves results.
9. **HOW IT WORKS:** Root absorption. Inhibits cell division.
10. **EXPECTED RESULTS:** Plant growth stops, turns brown and dies.
11. **EFFECT OF RAINFALL:** Improves efficacy.
12. **MOVEMENT IN SOIL:** Very little leaching. Readily absorbed on organic matter.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not harvest or graze within 90 days of applying 1.3 kg/ac or 60 days after lower rates. Wait 9 months before planting other crops.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) rats = technical (5,620-6,390).
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) to avoid exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in cool dry place.

KIL-MOR (2,4-D + mecoprop + dicamba)

Ciba-Geigy

CAUTION POISON

1. **FORMULATIONS:** Liquid. 295 g/L 2,4-D + 90 g/L mecoprop + 110 g/L dicamba. 2 X 10 L jugs.
2. **REGISTERED MIXES:** Aatrex Liquid or Aatrex Nine-0 (corn).
3. **CROPS:**

barley (8.5)	oats (8.6)	stubble fields	wheat (7.9)
corn (8.3)(field, sweet)	roadsides	summerfallow	(durum, spring, winter)

Underseeding: Not recommended.

4. **WEEDS CONTROLLED:**

In crops			**Along roadsides**
artichoke, Jerusalem (in corn)	knotweed	ragweed, common	alders
bindweed, hedge	lady's-thumb	shepherd's-purse (8.6)	chicory
buckwheats [tartary,	lamb's-quarters (8.5)	smartweeds, annual (7.7)	cockle, white
volunteer, wild (7.9)]	mustards [ball, volunteer,	sow-thistle, annual	goat's-beard
cockle, cow (7.6)	wild (8.6), wormseed]	spurry, corn (7.3)	poison-ivy
cocklebur	pigweed [prostrate,	stinkweed (8.6)	ragwort
flixweed (7.8)	redroot (7.7)]	thistle, Russian (7.3)	sheep-laurel
			thistle, bull

5. **WEEDS SUPPRESSED:** Field bindweed, Canada thistle (5.8), cleavers (7.0), round-leaved mallow.

6. **WHEN USED:**
Barley: 2-3 leaf stage.
Corn: Overall spray prior to 15 cm height of corn, use drop nozzles after 15 cm height.
Oats: 3-4 leaf stage.
Roadsides: Spring when weeds are in 2-5 leaf stage and growing actively.
Wheat (spring): 3-5 leaf stage.
Wheat (winter): In spring before crop is 30 cm high.

7. **HOW TO APPLY:**
With: Ground equipment.
Rate:
Barley:
340 mL/ac.
Corn (sweet), oats, wheat (spring, winter): 340-445 mL/ac.
Roadsides: 1.3 L/ac.
Stubble, Summerfallow: 445-710 mL/ac.
Tank mix: Kil-Mor 345-445 mL/ac+(Aatrex Liquid: 910 mL/ac **or** Aatrex Nine-0: 506 g/ac.)
Water Volume: 40 L/ac for cereals; 80-140 L/ac for corn.
Pressure: 275 kPa.

8. **APPLICATION TIPS:** Barley is the most sensitive crop to Kil-Mor. Ensure that proper rate, water volume and timing are used, otherwise, crop injury may occur. Risk of crop injury increases as water volume drops below 36 L/ac. Do not apply when temperatures exceed 27°C and relative humidity is very high.

9. **HOW IT WORKS:** Accummulates in the growing points resulting in abnormal growth which disrupts the transport system in plants.

10. **EXPECTED RESULTS:**
Weeds: Visible effects occur 7-14 days after spraying. Leaves curl, leaf petioles twist, leaf edges turn brown, the whole plant ceases growth, eventually turns brown, and dies.
Crop: Improper applications can result in abnormal bending at the internodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels, and sterile florets. **Poor results may be expected if** inadequate coverage. Rainfall less than 4 hours after application. Weeds overmature.

11. **EFFECTS OF RAINFALL:** Do not spray if rain is expected within 4 hours.

12. **MOVEMENT IN SOIL:**
2,4-D/mecoprop: Readily mobile in the soil.
Dicamba: Relatively mobile; mobility affected by capillary movement and/or surface evaporation. Concentration and location in the soil profile will be determined by total seasonal precipitation, its frequency, and original herbicide dosage.

13. **GRAZING AND CROPPING RESTRICTIONS:**
Drift: Tomatoes, sugar beets, sunflowers, beans, turnips, cauliflower, cabbage, ornamentals and fruit crops are very sensitive to drift.
Grazing Restrictions: Do not feed treated crop to livestock until 7 days after application.
Crop Use After Hail: No restrictions.
Succeeding Crops: No restrictions.

14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = 2,4-D (300-1,200); mecoprop (930); dicamba (2,629); Kil-mor (1,000). Non-toxic to fish. Toxic to bees.

15. **PRECAUTIONS, FIRST AID:** Cans may burst when heated above 100°C. Intake may cause convulsions. Wear standard protective clothing (see page xx) to reduce exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.

16. **STORAGE:** Heated storage only.

KRENITE (fosamine)

DuPont

1. **FORMULATIONS:** Water Soluble Liquid; 480 g/L; 10 L pack.

2. **REGISTERED MIXES:** None.
Non-ionic Surfactants: Tween 20.

3. **CROPS:** Brush control on non-crop areas only.

4. **WEEDS CONTROLLED:**

alder	cherry*	hemlock*	poplar (trembling aspen, largetooth aspen*)
ash	elm	maple	spruce, white*
beech	fir, balsam*	oak	
birch	hazel	pine	

*Highest rate.

5. **WEEDS SUPPRESSED:** Not applicable.
6. **WHEN USED:** From mid-June to end of July.
7. **HOW TO APPLY:**
   With: High volume ground equipment.
   Rate: 10.0-15.0 L/1,000 L of water. Add 1-2 L of surfactant to the mixture. Use higher rate for balsam fir, cherry, hemlock, largetooth aspen, white spruce.
   Water Volume: 200-1,200 L of spray solution/ac to point of runoff.
8. **APPLICATION TIPS:** Do not apply to food crops. A non-ionic surfactant is required to control most conifers and to control the root suckering of deciduous brush.
9. **HOW IT WORKS:** Absorbed by leaves, stems and buds. Restricts bud development the following spring.
10. **EXPECTED RESULTS:** Injury may not be observed until the following spring, particularly if minimum rates are used or if cool temperatures prevail when spraying is done. Plants will fail to develop leaves and subsequently die.
11. **EFFECTS OF RAINFALL:** Rainfall within 24 hours of application may reduce effectiveness.
12. **MOVEMENT IN SOIL:** Little downward movement as Krenite readily adsorbs to soil colloids.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze on land treated with Krenite.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (24,000). Non-toxic to birds and fish.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a cool dry place.

KROVAR I (bromacil + diuron)

DuPont

1. **FORMULATIONS:** Wettable Powder; 40% bromacil + 40% diuron; 2 kg, 25 kg bags.
2. **REGISTERED MIXES:** None.
   Mixing Instructions: Weigh out the proper amount of Krovar and mix into necessary volume of water (minimum 20L water/kg of Krovar). Agitate continuously by mechanical or hydraulic means. Do not use air agitation.
3. **CROPS:** Non-crop areas only. Total vegetation control.
4. **WEEDS CONTROLLED:** Most annual and perennial weeds and grasses.
5. **WEEDS SUPPRESSED:** Not applicable.
6. **WHEN USED:** Before weeds emerge or when actively growing. Remove dense growth before treatment. Do not apply when ground is frozen. Sufficient moisture is required to carry the chemical to the root zone of the weeds.
7. **HOW TO APPLY:**
   With: Boom sprayer, handgun, back pack, or sprinkling can.
   Rate:
   General Weed Control: 5.3-7.3 kg/ac. Use higher rates on soils containing 5% or more organic matter or soils high in clay content. Use 5.5 kg/ac on sandy or sandy loam soils only.
   Retreatment of Regrowth: 2.75-3.6 kg/ac when annual weeds reappear on previously treated sites.
   Small Areas: 180 g/100 m^2, approximately 7.3 kg/ac.
   Water Volume: 20 L water (minimum)/kg of Krovar I. 100-1000 L/ac. Use enough water to uniformly cover area to be treated.
   Nozzles: Screens should be 50 mesh or larger.
8. **APPLICATION TIPS:** Applying, draining or flushing equipment too near feeding roots of susceptible vegetation may cause injury. Do not use on lawns, walks, driveways, tennis courts, or similar areas. **Do not apply to slopes as soil erosion may occur.** Thoroughly clean all traces of Krovar I from application equipment immediately after use.
9. **HOW IT WORKS:** Readily absorbed through the roots, leaves and stems.
10. **EXPECTED RESULTS:** Plants become chlorotic and then die. The degree of control and duration of effect will vary with the amount of chemical applied, soil type, rainfall, and other factors. **Poor results occur if** weeds are too mature or insufficient rainfall.
11. **EFFECTS OF RAINFALL:** Rainfall will leach the chemical into the root zone.
12. **MOVEMENT IN SOIL:** Movement in soil is faster with heavier rainfall. Do not use in areas subject to soil erosion.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Drift: All crops and ornamentals may be injured by chemical drift.
    Succeeding Crops: Krovar I is a non-selective residual herbicide. It should only be used on non-crop areas where bare ground is desired.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = bromacil (5,200), diuron (3,400); Non-toxic to birds. Toxic to fish.

15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a cool, dry place.

LADDOK (bentazon + atrazine)

BASF

CAUTION POISON

1. **FORMULATIONS:** Liquid Suspension; 200 g/L bentazon + 200 g/L atrazine; 1 X 10 L Laddok + 1 X 8 L Assist Oil Concentrate.
2. **REGISTERED MIXES:** None.
   Surfactant: Assist Oil Concentrate.
3. **CROPS:** Corn (field, seed, silage, sweet). Seed corn producers should consult the seed corn company regarding tolerance of seed production lines to Laddok + Assist Oil Concentrate.
4. **WEEDS CONTROLLED:**

buttercup	groundsel, common*	nightshade, black	rape, bird*
chickweed, common	lady's-thumb	pigweed, redroot*	smartweeds, annual
cocklebur	lamb's-quarters*	purslane	spurry, corn
cudweed, low	mustard, wild	ragweed (common, giant)*	thistle, Russian
galinsoga, hairy			velvetleaf

   *Triazine resistant strains of these weeds are controlled by Laddok.
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Apply early post-emergence when weeds are small and actively growing (usually corresponds to corn growth stages of one to five leaves). Under good growing conditions the most effective time for application usually is 18-28 days after planting. A cultivation may be necessary if additional weeds emerge after the application. Corn is tolerant to Laddok at all stages of growth.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Rate: 1.2-1.6 L/ac. Use the rate appropriate for weed size as shown in the application rate table of the Laddok label. Where **Dual** has been applied as a pre-emergent grass herbicide the application rate of Laddok may be reduced to 0.8-1.0 L/ac. Assist Oil Concentrate at 1.0 L/100 L of spray volume should be added for all applications of Laddok.
   Water Volume: 80-160 L/ac.
   Pressure: 275-400 kPa.
   Nozzles: Flat fan or cone type only recommended.
8. **APPLICATION TIPS:** Best results if weeds are young and actively growing. Do not apply where runoff erosion is likely to occur. Do not apply if crop is under stress from prolonged cold weather, poor fertility or when crop is wet and succulent from recent rainfall as crop injury may occur. It is important to obtain complete spray coverage of al leaves for best control.
9. **HOW IT WORKS:** Both bentazon and atrazine are contact herbicides interfering with photosynthesis.
10. **EXPECTED RESULTS:**
    Weeds: Turn yellow, then brown, usually within 2 weeks.
    Crops: Occassionally show light leaf speckling. **Poor results may occur if weeds** are too mature, failure to penetrate crop canopy or under conditions of prolonged cool weather or drought.
11. **EFFECTS OF RAINFALL:** Within 6-8 hours may reduce activity.
12. **MOVEMENT IN SOIL:** Very little, except in sandy soil and with excessive moisture.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Grazing Restrictions: Treated plants can be used for silage.
    Succeeding Crops: On very light soils with low organic matter some atrazine may carry over and injure susceptible crops. Injury may also occur if land treated with Laddok is planted to any crop other than corn in the same season.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (3,000).
15. **PRECAUTIONS, FIRST AID:** Intake may cause convulsions and coma. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a cool dry place above 0^{0}C.

LASER (fenoxaprop-ethyl + bromoxynil + MCPA)

Hoechst

1. **FORMULATION:** Emulsifiable Concentrate; 238 g/L; 20 L container.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Spring wheats only. Do not apply on durum wheat.
4. **WEEDS CONTROLLED:** Bluebur, buckwheat [tartary, wild], night-flowering catchfly, scentless chamomile, cow cockle, cocklebur, common groundsel, flixweed, foxtail [green and yellow], kochia, lady's-thumb, lamb's-quarters, mustard [ball, wild], red-root pigweed, smartweed [green, pale], shepherd's-purse, stinkweed, volunteer rapeseed, volunteer sunflower.
5. **WEEDS SUPPRESSED:** Canada thistle, perennial sow thistle.
6. **WHEN USED:**
   Grassy Weeds: Green and yellow foxtail apply at 1-6 leaf stage. This means that Laser must be applied to a plant where the number of leaves on the main shoot plus tillers does not exceed 6. (The counting of tillers as leaves is not in agreement with this publication, see page vi).
   Broadleaf Weeds: Seedling up to 4 leaf stage. Buckwheats, stinkweed, mustards, lamb's-quarters and common groundsel - seedling up to 8 leaf stage. Spray Russian thistle and kochia before plants are 5 cm high.
   Crop: Treat from the 2 leaf until the early flag leaf.
7. **HOW TO APPLY:**
   With: Ground equipment. Do not apply by aircraft.
   Rate: 1 L/ac.
   Water Volume: Ground: 45 L/ac.
   Pressure: Ground: 275 kPa.
   Nozzles: Only 110° or 80° flat fan recommended. Application of the spray at a forward angle of 45° will result in better coverage and penetration of the canopy. Do not use flood jet nozzles or controlled droplet application equipment.
8. **APPLICATION TIPS:** Do not treat cereals underseeded with forages. During periods of stress, plants are not actively growing. When daytime temperatures before or after application are very hot (28°C or 82°F) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Laser during these periods may result in substantially reduced control. Under these conditions, yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity of yield. Good spray coverage and penetration may be difficult if weed populations are extremely high.
9. **HOW IT WORKS:**
   Fenoxaprop-ethyl: Contact as well as systemic, no soil activity. Regions of high meristematic activity, such as the root and shoot tips are known to be affected.
   Bromoxynil: Inhibits photosynthesis and plant respiration.
   MCPA: Disrupts cell division and causes abnormal growth responses that affect respiration and food reserves.
10. **EXPECTED RESULTS:**
    Foxtail: Reduction of leaf growth and chlorotic blotching within 1-3 days after application. Initial development of leaf chlorosis within 5-8 after application and complete death within 14-21 days after application.
    Broadleaf weeds: Small burnt spots on the leaf can appear within hours, death takes up to 2 weeks.
11. **EFFECTS OF RAINFALL:** Do not apply Laser if rain is expected within 3 hours.
12. **MOVEMENT IN SOIL:** Fenoxaprop-ethyl appears to undergo rapid hydrolysis in the soil. Bromoxynil and MCPA are readily leached from the soil.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Grazing Restrictions: Do not graze treated fields prior to harvest.
    Pre-Harvest Intervals: 60 days.
    Succeeding Crops: No restriction.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = 1510.
15. **PRECAUTIONS, FIRST AID:** Wear chemically resistant nitrile gloves (e.g. Edmont SOL-VEX #37-155/37-145 or PIONEER A-15). Gloves should be worn when mixing/loading, spraying and during clean-up and repair. Do not use leather or cloth gloves. Wear protective clothing (see page xx) and goggles. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake of a large dose may cause sudden collapse and coma.
16. **STORAGE:** Do not store below freezing. If stored for one year or longer, shake well before using.

LENTAGRAN (pyridate)

United Agri Products

CAUTION POISON

1. **FORMULATION:** Wettable powder, 45% pyridate, 1 kg. water soluble bags, 8 x 1 kg/carton.
2. **REGISTERED MIXES:** (corn) Atrazine, (tomatoes) Metribuzin. Do not use with oil surfactants.
   Mix Instructions: Fill spray tank about 1/2 full with water. Add the required amount of Lentagran 45 WP. When used in combination with other products, add wettable powders or dry flowables first, followed by aqueous flowables, then emulsifiable concentrates. Agitate thoroughly and continuously. When all materials have been added and thoroughly agitated, add the remainder of the amount of water to be used for spraying. Agitation must be continued during spraying until spray tank is empty. Contents of spray tank should be used immediately and may not be stored.
3. **CROP:** corn - seed, field, sweet; tomatoes.
4. **WEEDS CONTROLLED:**

   Lentagran + Tank Mixes:

lamb's-quarters	ragweed, common
mustard, wild	smartweed
nightshade	shepherd's purse
pigweed, redroot	velvet leaf
purslane	

   Lentagran:

lamb's-quarters	pigweed, redroot

5. **WEEDS SUPPRESSED:**

   Lentagran: None.

   Lentagran and Tank Mixes:

buckwheat, wild	foxtail (green, yellow)
grass (crab, barnyard)	lady's thumb

6. **WHEN USED:** Lentagran can be used alone or in tank mix combinations with Atrazine (corn) or metribuzin (tomatoes) for broadleaf weed control. For broadleaf and grassy weed control, it is recommended that Lentagran alone or Lentagran tank mixes follow a preplant incorporated or pre-emergent grass herbicide.
   Lentagran and Atrazine - post emergent. Apply up to the 4 leaf stage of broadleaf weeds and up to the 3 leaf stage of grassy weeds.
   Lentagran and Metribuzin - post emergent. Do not apply before the tomato plants reach the five leaf stage. Apply when weeds are in the 1-4 leaf stage.
7. **HOW TO APPLY:** With ground equipment.
   Rates:
   Lentagran: 810 g/acre.
   Lentagran + Atrazine: 400 g/acre + 400 gal/acre.
   Lentagran + Metribuzin: 400-800 g/acre + 60-121 gal/acre.
   Water Volume: Apply with 60-120 L/acre.
   Pressure: Apply @ 175 - 250 kPa.
8. **APPLICATION TIPS:** Do not apply more than once a year.
   Lentagran + Atrazine Application: Lentagran + Atrazine are to be applied in a sequential treatment with a pre-emergent grass herbicide, or in fields with no or low grass infestation.
   Lentagran and Metribuzin: Apply as directed spray to lower 1/3 of tomato plant. For broader spectrum weed control including grasses, apply trifluralin as a preplant incorporated, then follow, as directed with the Lentagran and metribuzin.
9. **HOW IT WORKS:** Rapidly absorbed by leaves. Interferes with photosynthetic process in susceptible weeds.
10. **EXPECTED RESULTS:** Visible evidence generally occurs within 4-7 days of application. Activity is evident by marginal yellowing, followed by browning and yellowing of the entire leaf. Activity is more rapid at high temperature and under good growing conditions. Weed control under drought conditions may be decreased.
11. **EFFECT OF RAINFALL:** Rainfall within 1-2 hours after application may decrease activity.
12. **MOVEMENT IN SOIL:** No movement in soils.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not harvest for either human or animal consumption for at least 45 days after application. Grazing and cropping restrictions should also be followed as per the atrazine and metribuzin label precautions. Do not apply when conditions favour drift from target area.
14. **TOXICITY:** Moderate mammalian toxicity oral LD50 rats (mg/kg) = (Lentagran) 2230. An eye irritant. Potential skin sensitizer.
15. **FIRST AID:** Wear standard protective clothing (see page XX) to avoid exposure. **If on skin,** wash with plenty of soap and water. Seek medical attention if irritation persists. **If in eyes,** wash and flush with plenty of water for 15 minutes. Seek medical attention. **If swallowed,** drink 1 or 2 glasses of water, induce vomiting and seek medical attention. Do not induce vomiting in an unconscious person.
16. **STORAGE:** Do not freeze.

LEXONE (metribuzin)

DuPont

1. **FORMULATIONS:** Dry Flowable, Lexone DF; 75%; 2.5 kg jug. Liquid Suspension; Lexone L; 480 g/L; 10 L jug.
2. **REGISTERED MIXES:** Banvel (barley, wheat), Eptam 8-E (potatoes), MCPA amine 500 (barley, wheat), Treflan 545 EC (fababeans), Gramoxone (potatoes).
   Mix Instructions: Shake Lexone L containers well before adding to tank.
3. **CROPS:** Barley(8.9)(except Klondike), fababeans (Lexone+Treflan), peas (field) (8.5) **(Lexone DF only)**, potatoes (8.6)(except red skinned, or early maturing varieties, Belleisle, ND 146-4R, Rideau, Shepody, Tobique), tomatoes, wheat (8.5)(spring).
4. **WEEDS CONTROLLED:**

buckwheat, tartary (5.3)	lady'-thumb	pigweed, redroot (7.1)	smartweeds, green (8.5)
chickweed (8.1)	lamb's-quarters (8.4)	rapeseed, volunteer (8.8)	spurry, corn (7.1)
hemp-nettle (8.4)	mustard (ball, wild)(8.0)	shepherd's-purse	stinkweed (8.2)

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Barley, wheat: Lexone, 2-5 leaf; Banvel Mix, 2-3 leaf; MCPA Mix, 3-5 leaf.
   Fababeans: Treflan Mix, pre-plant incorporated in spring or fall.
   Peas (field; dryland)(Lexone DF only): When weeds are less than 5 cm tall and before pea vines are 15 cm long. Do not use of peas undersown to forages. Do not apply on sandy textured soils containing less than 3% organic matter.
   Potatoes: Crop injury may result if used on sandy or coarse textured soils with less than 1% organic matter. Resistence to Lexone varies among varieties. Test for safety on a limited area before large scale sprays are adopted. Do not use on red skinned or early maturing varieties, Belleisle, ND 146-4R, Rideau, Shepody, or Tobique.
   Potatoes (dryland): Lexone, early post-emergent - apply over the top of potato plants soon after emergence and before weeds are 4 cm tall. Eptam Mix, pre-plant incorporated: apply as by Eptam label. Crop injury may occur if used on soil with greater than 7% organic matter or, on sandy or coarse textured soils with less than 2% organic matter.
   Potatoes (irrigated): Lexone, pre-emergent: a single application after planting (at least 5 cm deep) or hilling but before crop emerges and before weeds are 3 cm tall. Lexone, early post-emergent: applied following 3 or more successive days of sunny weather. Treat before weeds are 3 cm tall and potatoes are less than 10 cm tall. Lexone, pre+post-emergent - same as early post-emergent but do not apply more than 910 mL/ac or 567 g/ac per season.
   Tomato transplants, grown for processing only: As directed spray before weeds are 4 cm tall. Avoid spray contact with at least 2/3 of the tomato foliage. Best results when plants are well established about 3 weeks after transplanting. Do not apply to direct-seeded tomatoes.
7. **HOW TO APPLY:**
   With: Ground equipment. 50 mesh line strainer and screens.
   Water Volume: Barley, fababeans, peas (field; dryland), wheat (spring): 32-40 L/ac. Potatoes: dryland 81-121 L/ac; irrigated 61-121 L/ac. Tomato transplants, grown for processing only: 81 L/ac.
   Rate:

Crop	Lexone DF (g/ac)	Lexone L (mL/ac)	Tank Mix
Barley	110-142	170-220	NA*
Barley, wheat (spring)	110	170	Banvel 480 - 93 mL/ac
Barley, wheat (spring)	110-142	170-220	MCPA Amine 345-445 mL/ac
Wheat (spring)	110	170	NA
Fababeans (fall)	160-220	250-345	Treflan 545 EC 810-1050 mL/ac
Fababeans (spring)	140-220	220-345	Treflan 545 EC 610-810 mL/ac
Peas (field; dryland) post-emergent	115-150	NR**	Do not tank mix.
Potatoes (dryland) early post-emergent	140	220	NA
Potatoes (dryland) pre-plant	140-220	220-345	Eptam 8-E 1.7-2.2 L/ac
Potatoes (irrigated) early post-emergent	285-390	445-610	NA
Potatoes (irrigated) pre-emergent	260-567	400-910	NA
Potatoes (irrigated) pre + post-emergent	567 maximum	910 maximum	NA
Potatoes (irrigated and dryland) pre-emergent	335-485	Gramoxone 1.11 L/ac	
Tomato transplants (light soils)	130	200	NA
Tomato transplants (medium soils)	260	400	NA
Tomato transplants (heavy soils)	260-445	400-710	NA

   *NA-Not Applicable.
   **NR-Not Registered.
8. **APPLICATION TIPS:** Allow 4-5 day interval before or after application of wild oat herbicides. If frost occurs, allow 4-5 day interval for crop to recover before applying Lexone. Crop must be planted at least 5 cm deep.

9. **HOW IT WORKS:** A systemic herbicide absorbed by foliage and roots. Affected plants become chlorotic and stunted. Death usually occurs 10-14 days after treatment. Because Lexone leaves a residue in the soil, control of shallow germinating weeds (eg. chickweed) occurs throughout the growing season.
10. **EXPECTED RESULTS:**
    Weeds: Should start to yellow within 7-10 days after treatment.
    Crop: Temporary (7-10 days) lightening in colour and occasionally a slight reduction in height may occur, especially if frost or abnormally high temperatures occur within 1-2 days of application. Injury to barley can occur if there is shading for 12 hours after spraying. Thus avoid late evening or cloudy day applications. **Poor results may be expected if** it rains immediately after application or weeds are under stress or too mature.
11. **EFFECTS OF RAINFALL:** Do not spray if rain is expected within 2 hours.
    Peas: Weed control may be reduced if rain falls within 6 hours after spraying. Heavy rainfall immediately after application may decrease activity.
12. **MOVEMENT IN SOIL:** Readily leached in sandy soils low in organic matter. Little leaching occurs in soils with high organic matter.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not apply within 60 days of harvest. Peas (field): do not apply within 70 days of harvest.
    Grazing Restrictions: Do not graze or feed to livestock within 30 days of application. Peas (field): do not graze or feed treated crop until 70 days after application.
    Succeeding Crops: Canola, celery, cole crops, cucurbits, lettuce, onions, peppers, spinach, sugar beets, sunflowers, table beets, and turnips may be injured if planted in Lexone treated soil both during year of application and the following crop year. Fall seeded or cover crops such as oats and rye may be injured if seeded during the same season as Lexone treatment.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (1,100-2,300). Slightly toxic to fish and birds. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Lexone DF: cool dry place. Lexone L: warm storage preferred. If frozen ensure material has been thoroughly resuspended.
    Note: A similar product is Sencor.

LINURON 400L

United Agri Products

1. **FORMULATION:** Liquid Flowable; 400 g/L; 10 L jugs.
2. **REGISTERED MIXES:** None.
3. **CROPS:**

asparagus	dill	saskatoon berries
carrots	potato	chokecherries
parsnips	soybean	

4. **WEEDS CONTROLLED:**
    Annual grasses: Barnyard grass, yellow foxtail, fall panicum.
    Broadleaf:

buckwheat, wild	groundsel
chickweed, common	knotweed
dandelion, seedling	kochia
goosefoot	lamb's-quarters
mustard, wormseed	shepherd's-purse
pigweed (prostrate, redroot)	smartweed, annual
purslane	spurry, corn
radish, wild	stinkweed
ragweed, common	

    Seedling of: Dandelion, plantain, sow-thistle
5. **WEEDS SUPPRESSED:** Green foxtail, field horsetail.
6. **WHEN USED:**
    Linuron 400L:
    Asparagus, potatoes: Pre-emergent.
    Carrots, parsnips, dill: 2 or more leaves, before grassy weeds 5 cm tall, broadleaf weeds 15 cm.
    Soybean: Pre-emergent.
    Saskatoons: Post, early spring or late fall.
    Chokecherries: Post, fall application.

7. HOW TO APPLY:

With: Ground equipment.

Crop	Method	Rates (L/ac) Muck & clay soil with medium organic matter	(Overall) Broadcast Loam or clay soil with low organic matter
Soybean	Do not use on sand low in organic matter (less than 3%). Do not spray on emerged crop.	1.72 - 2.23 L/ac	1.11 - 1.72 L/ac
Rotary hoe may be used.	1. At planting time: Light incorporation improves control and reduces possible injury from splashed soil.		
Pre-emergence	2. **State Seeded:** Prepare soilbed 3 to 4 weeks before planting without further cultivation prior to seeding, allowing weed seedings to emerge.	1.11 - 1.72 L/ac	
	Plant soybeans at least 4.5 cm deep with a double disc opener keeping disturbance of soil to a minimum.	80 - 120 L/ac, water	
	Apply as a broadcast spray.		
	Control less dependent on rainfall.		
Volume of Water	Use 30 to 120 litres of water per acre of overall spraying.		

		Rates (L/ac) Muck & clay soil with medium organic matter	(Overall) Broadcast Loam or clay soil with low organic matter
Potato			
Plant seed at least 5 cm deep	Apply just before crop emerges or when tops are completely covered by hilling. Avoid further cultivation until absolutely necessary. Basfapon (dalapon) may be added at recommended rate to centre emerged annual grasses and quack grass. Treat before emerged grasses are 5 cm tall and before broadleaf weeds are 15 cm tall.	1.72 - 2.23 L/ac	1.11 - 1.72 L/ac
Volume of Water	Use 80 to 120 litres of water per acre of overall spraying.		
Carrot, Parsnip, Dill Pre-emergence	Plant seed at least 1.5 cm deep. Apply after planting. Rain or irrigation is needed for good control. Additional post emergence treatment may be needed.	0.8 - 1.11 L/ac	0.6 - 0.8 L/ac
Volume of Water	Use 80 to 120 litres of water per acre of overall spraying.		
Asparagus Pre-emergence	Apply before cutting season immediately following discing and repeat at the end of the cutting season after discing.	2.23 L/ac	1.72 L/ac
Volume of Water	Use 80 to 120 litres of water per acre of overall spraying.		

Saskatoon Berries (established plantings)
For control of annual broadleaf weeds and grass:
Apply 2.0 to 3.0 L per acre in early spring or fall as a directed basal spray.
Do not apply more than once per season.
Do not apply within fifty (50) days of harvest.

Volume of Water Use 80 to 120 litres of water per acre of overall spraying.

Chokecherries (fall seeded plantings)
For control of annual broadleaf weeds and grass:
Apply 1.72 L/acre in 90 L/acre water.
Application should be made in October after Chokecherries are sown.
Only make one application per year.

Volume of Water Use 80 to 120 litres of water per acre of overall spraying.

8. **APPLICATION TIPS:** Early application will avoid crop injury. **Make only 1 Linuron 400L application per crop year.** Do not apply to crops under drought, heat or frost stress.
9. **HOW IT WORKS:**
Linuron 400L: Both systemic and contact, absorbed by roots and leaves.
10. **EXPECTED RESULTS:** First, browning of older leaf tips, then water soaked, wilted appearance, progressive yellowing, stem collapse, brown and death. **Poor results may be expected if** incorrect timing of application, stress conditions, crusted soil, or rain immediately after spraying.
11. **EFFECTS OF RAINFALL:** Requires rainfall or irrigation for activation of pre-emergent applications. Rainfall within 1 hour may decrease post-emergent effect. Unusually heavy rains after a pre-emergent application may cause severe injury to corn, carrots, or parsnips.
12. **MOVEMENT OF SOIL:** Higher rates of Linuron 400L and extreme moisture may cause some leaching.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or feed green plants to livestock. Do not apply to Saskatoons within 50 days of harvest. No restriction on succeeding crops except if 2.0 L/ac or more is applied (possible 25% carry over to next season).
14. **TOXICITY:** Very low mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (4,000). May irritate eyes, skin, nose and throat. Toxic to fish.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles. **If in eyes** or **on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Do not store below 5°C. If stored for 1 year or longer, shake well before using.
Note: Similar products are Afolan F and Lorox.

LONTREL (clopyralid)

DowElanco

1. **FORMULATIONS:** Solution: 200 g/L; 4 L jug.
2. **REGISTERED MIXES:** Canola: Fusilade 250, Hoe-Grass 284, Poast; Flax and Oats: MCPA; Wheat and Barley: 2,4-D, MCPA.
3. **CROPS:** Canola, sugarbeets, wheat, oats, barley, flax, summerfallow, non-crop farmland, forage grasses, strawberries.
Underseeding: Not recommended for forage legumes.
4. **WEEDS CONTROLLED:**
Alsike clover (in timothy only) buckwheat, wild (6.5) chamomile, scentless thistle, Canada (7.2)
5. **WEEDS SUPPRESSED:** Canada thistle (top control only at lowest Lontrel rate), perennial sow-thistle (7.0)(top control only), sorrel.
6. **WHEN USED:** Canada thistle at rosette to pre-bud stage and actively growing. Other weeds at seedling stage and actively growing.
Canola: 2-6 leaf stage.
Flax: 5-10 cm high.
Grasses: (Seeding) 2-4 leaf stage. (Established) Shot blade, after harvest, early spring.
Strawberry: After harvest, prior to mulching.
Sugarbeets: Cotyledon to 8 leaf stage.
Wheat, barley and oats: 3 leaf to flag leaf stages. When tank mixed with 2,4-D or MCPA observe timing on their labels.
7. **HOW TO APPLY:**
With: Ground equipment.
Water Volume: 40-80 L/ac.

Pressure: 200-275 kPa.
Nozzles: Flat fan nozzles preferred.
Rate:

Weeds	mL/ac
Canada thistle (top growth control for 6-8 weeks).	300
Wild buckwheat, Canada thistle (season-long control), perennial sow-thistle (top growth control), scentless chamomile.	400
Wild buckwheat, Canada thistle (season-long control and suppression into following season), perennial sow-thistle (top growth control), scentless chamomile.	600

8. **APPLICATION TIPS:** Make sure the sprayer tank has been thoroughly cleaned before Lontrel is mixed in the tank. Trace contamination from 2,4-D; MCPA; Glean; Ally; or similar herbicides will result in damage to canola. Treat crop during warm weather when weeds are actively growing. Best results are obtained when Canada thistle are actively growing and soil moisture is adequate for rapid growth. Under cool or dry conditions, control of Canada thistle may be severely reduced. Sow thistle plants that emerge after spraying will not be controlled.
Forage Grasses: For control of the weeds listed on the label plus alsike clover, apply **Lontrel** Herbicide at the rate of 0.30 - 0.60 L/ac in 45 - 90 L/ac of water. Make one application per season by ground sprayer. For seedling timothy, apply at the 3-leaf stage and beyond. For established timothy, apply in the fall after harvest or early spring.
9. **HOW IT WORKS:** Clopyralid is a systemic, hormone-type herbicide. It is absorbed by leaf and stem surfaces and readily translocated. Maximum efficacy results from foliar application to young actively growing plants.
10. **EXPECTED RESULTS:** Growth will first slow then cease. Death of weed may not occur until 14-21 days after treatment. With the lowest rate on Canada thistle some regrowth may occur by the end of the season but this will not interfere with harvesting of crop.
11. **EFFECTS OF RAINFALL:** A rain free period of 4-6 hours is required.
12. **MOVEMENT IN SOIL:** Clopyralid is somewhat soluble in water, but is generally not mobile in soil under typical prairie conditions.
13. **GRAZING AND CROPPING RESTRICTIONS:**
Drift: Small amounts of drift may damage broadleaf plants.
Succeeding Crops: Fields previously treated with Lontrel can be seeded to barley, forage crops, flax, mustard, oats, rapeseed, rye, wheat, or can be summerfallowed the year after treatment. Do not seed to crops other than those listed above, the year after treatment. For more cropping and use information, contact DowElanco at 1-800-661-6436.
Grazing Restrictions: Do not graze or cut for livestock feed within 7 days of treatment. Do not cut or graze forage grasses for livestock feed within 60 days of treatment.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats = greater than 5,000 mg/kg. Acute oral LD $_{50}$ bees = greater than 100 ug/bee. Extremely low toxicity to fish.
15. **PRECAUTIONS, FIRST AID: Flammable.** Wear standard protective clothing (see page xx) to reduce exposure. Rubber gloves and goggles should be worn when handling concentrated formulation. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store away from food, feedstuffs, fertilizer, seeds, insecticides, fungicides, or other pesticides. Store in heated storage away from open flames or sparks. If frozen, warm slowly to room temperature and mix thoroughly before use.

LOROX (linuron)

DuPont

1. **FORMULATIONS:** Liquid Suspension; Lorox L; 480 g/L; 10 L jug. Dry Flowable; Lorox DF; 50%; 5.0 kg jug.
2. **REGISTERED MIXES:** Estermine MCPA, MCPA amine 500 [barley, oats, wheat (spring)]; MCPA K-Salt [barley, wheat (spring)]; Target [barley, oats, wheat (durum, spring)]; Sweep+MCPA amine 500 (chemical fallow).
Mix Instructions: Shake Lorox containers thoroughly before adding to tank. If a surfactant is recommended, dilute with 10 parts of water and add as last ingredient to nearly full tank.
3. **CROPS:**

Lorox L		Lorox L+MCPA Amine 500	Lorox DF
asparagus (8.7)	fruit trees, established*	barley (8.6)	carrots (8.2)
carrots (8.2)	potatoes (8.7)	oats (8.9)	potatoes (8.7)
corn, field (6.5)	shelterbelts, established**	wheat (spring, durum)(8.2)	soybeans

established-stock established at least 1 year.
*Apple, cherry, pear, plum.
**Ash (green), caragana, elm (American, Siberian), maple (Manitoba), pine (Scotch), poplar, spruce (Colorado, white), willow.

4. WEEDS CONTROLLED:

Lorox L/DF

barnyard, grass (8.3)	pigweed, redroot (7.9)
buckwheat, wild (8.5)	purslane (8.4)
chickweed, common (9.0)	ragweed
goosefoot (8.4)	shepherd's-purse
knotweed	smartweeds (9.0)
lamb's-quarters (7.9)	sow-thistle, annual
mustard, wormseed (8.9)	stinkweed (8.5)

Lorox L+MCPA Amine 500

buckwheat	pigweed, redroot (7.8)
[tartary (7.9), wild (7.5),	ragweed
chickweed, common (7.4)	shepherd's-purse
cockle, cow (6.8)	smartweeds (7.0)
flixweed	spurry, corn
hemp-nettle (7.5)	stinkweed (8.9)
lamb's-quarters (8.9)	stork's bill (8.2)

Underseeding: Forages not recommended.

5. WEEDS SUPPRESSED:

Lorox L: Foxtail [green (6.7), yellow].

Lorox L+MCPA: Foxtail (green, yellow); thistle (Canada)(4.7).

6. WHEN USED:

Weeds: 1-4 leaf.

Green foxtail: 1-3 leaf.

Crops:

Asparagus: Immediately after discing, before crop emergence; may be repeated after last cutting.

Carrots: Pre-emergent; after planting (at least 1 cm deep) but before crop emergence. Post-emergent; 2 or more fully developed true leaves (8-15 cm tall). Before annual grasses 5 cm tall, broadleaf weeds 15 cm tall. Pre+Post-emergent; observe limitations of Pre and Post-emergent treatments. To prevent crop injury treatments must be at least 2 weeks apart.

Cereals: 2-4 leaf.

Chemical Fallow: Sweep+MCPA Mix; when broadleaf weeds small and actively growing, annual grasses 2-4 leaf. Only 1/season, only in spring.

Corn: Lorox L; post-emergent, after corn is at least 38 cm tall, directed spray. Atrazine 80W Mix; pre-emergent, after planting at least 5 cm deep but before crop emergence. Do not spray over top of corn.

Fruit trees (established at least 10 years, peach 1 year): Directed spray under trees and bushes before buds open and before weeds 10 cm tall.

Potatoes: Pre-emergent; after planting (at least 5 cm deep) but before crop emergence. Before grassy weeds 5 cm tall, broadleaf weeds 15 cm tall. Treat after final hilling operation.

Shelterbelts (established): Stock planted for at least 1 year; directed spray **under trees** and bushes before buds open in spring, before weeds 10 cm tall.

7. HOW TO APPLY:

With: Aircraft or Ground equipment.

Water Volume: Asparagus, potatoes: 120 L/ac. Carrots: 90-135 L/ac. Cereals: 40 L/ac minimum. Corn: pre-emergent 90-135 L/ac; post-emergent 70-140 L/ac. Fruit trees: 160-240 L/ac.

Incorporation: Not applicable.

Pressure: 275 kPa.

Nozzles: Flat fan recommended. 50 mesh line strainers and screens.

Lorox L or DF must be tank mixed with MCPA amine when applying to wheat, oats and barley or MCPA K when applying to wheat and barley.

Rate:

Crop	Time (crop)	Lorox L (L/ac)	Tank Mix
Asparagus	pre-emergent	1.4-1.8	NA*
Barley, oats, wheat (spring)	2-4 leaf	0.17-0.22	MCPA Amine 500; 345-445 mL/ac
Barley, wheat (spring)	2-4 leaf	0.17-0.22	MCPA K-Salt; 405-567 mL/ac
Carrots	pre-emergent	0.45-1.37	NA
Carrots	post-emergent	0.91-1.82	NA
Carrots	pre+post-emergent	0.45-0.91; 0.91-1.82	NA
Chemical Fallow	spring only	0.21	Sweep 910 mL/ac + MCPA Amine 500; 445 mL/ac
Corn (2% or less soil O.M.)	pre-emergent	0.91	Atrazine 80W; 610 g/ac
Corn (2-5% soil O.M.)	pre-emergent	1.3	Atrazine 80W; 910 g/ac
Corn	post-emergent	0.97-1.82	Oil-water emulsion
Fruit trees	spring	3.6	Surfactant
Potatoes	pre-emergent	0.91-1.82	NA
Shelterbelts (established)	spring	1.82	NA

*NA-Not Applicable.

Crop	Time (crop)	Lorox DF (kg/ac)	Tank Mix
Barley, oats, wheat (spring)	post-emergent	0.16-0.21	MCPA Amine 500; 345-445 mL/ac
Barley, wheat (spring)	post-emergent	0.16-0.21	MCPA K-Salt; 465-567 mL/ac
Carrots	pre-emergent	0.4-1.3	
Carrots	post-emergent	0.9-1.8	
Carrots	pre+post-emergent	0.4-0.9; 0.9-1.8	
Potatoes	pre-emergent	0.9-1.8 kg/ac	

8. **APPLICATION TIPS:** **Do not use on sandy or coarse-textured soils, low in organic matter, as crop injury may result.** Do not use when crops are under drought stress. Fruit trees: avoid contact with fruit, foliage, and green bark with spray or drift as injury may result.
9. **HOW IT WORKS:** A systemic herbicide absorbed by leaves and roots. Yellowing (chlorosis), stunting and finally death occurs 10-14 days after treatment.
10. **EXPECTED RESULTS:**
Weeds: Yellowing starts 7-10 days after application. Effect greatest under excellent growing conditions. Weed control will vary depending on species, time of application and growing conditions.
Crop: A slight yellowing of crop and leaf tip and leaf margin burn may be seen 7-10 days after application. Crop recovers within 14-18 days. Crop injury can occur if applied during period of high heat.
11. **EFFECTS OF RAINFALL:** Heavy rainfall within 2 hours may decrease activity. Pre-emergent treatment requires rainfall or irrigation for activation. Carrots, corn, or potatoes may be severely injured if unusually heavy rains follow application.
12. **MOVEMENT IN SOIL:** Movement by leaching is least in soils high in clay and/or organic matter, greatest in sand.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not apply post-emergent corn treatment within 60 days of harvest. 25% carry over into next growing season if rates are 1.8 L/ac or higher. Do not feed or graze green material.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (4,000). Very toxic to fish. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Lorox L: Store in a heated area. Do not freeze as settling may occur. If frozen, thoroughly mix to resuspend.
Note: Similar products are Afolan F and Linuron 400L.

MATAVEN L (flamprop-methyl)

DuPont

CAUTION POISON

WARNING CORROSIVE

1. **FORMULATIONS:** Emulsifiable Concentrate; 52.5 g/L; 2 X 10 L pack.
2. **REGISTERED MIXES:** Glean [wheat only (durum, spring)].
Mixing Instructions: Mataven L Only: add 1/2 the required amount of water, add Mataven L, agitate, then add rest of water. Mataven L+Glean: add 1/2 the required amount of water, start agitation, add Glean and ensure that it is completely in suspension, add more water, then Mataven L, then the remainder of water. Surfactants or additives not required in Mataven L + Glean tank mix.
3. **CROPS:**

canary seed (8.7)	**Seed production only,* establishment year only**	fescue [creeping red (8.3),	trefoil, bird's-foot
triticale (8.7)	alfalfa (8.3)	meadow (7.2)]	wheatgrass [crested (7.6),
wheat (durum, spring, winter)	bromegrass (8.4)	milk vetch, cicer (8.2)	intermediate (7.9)]
(except Garnet, Selkirk)(8.7)	clover, red (8.0)	ryegrass, Russian wild (8.1)	
sunflowers (9.0)		sainfoin (8.6)	

*Do not graze or harvest for forage in the year of treatment.
4. **WEEDS CONTROLLED:** Wild oats (8.0).
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** 3 leaf to shot blade stage of wild oats. Wild oats at 2 leaf stage and younger may escape control and may grow to maturity. Do not apply beyond 6 leaf stage of the crop. Apply tank mix when wild oats in 3-4 leaf stage.
7. **HOW TO APPLY:**
With: Aircraft or Ground equipment. Do not apply Mataven L+Glean by air.
Rate: 2 L/ac.
Forage Grasses: 2.0-3.0 L/ac. High rate without a companion crop, low rate with companion crop for which Mataven L is registered.
Sunflowers: 2.0-2.6 L/ac.
Tank Mix: Mataven L 2.0 L/ac + Glean 6 g/ac.
Water Volume: Aircraft: 8 L/ac minimum; Ground: 40 L/ac.
Pressure: Ground 300 kPa.
8. **APPLICATION TIPS:** Best results will be obtained when the majority of wild oats are at the 3-4 leaf stage, but before the flag leaf stage. Allow 4-day interval between the application of Mataven L and the use of MCPA, bromoxynil, or bromoxynil+MCPA; and an interval of 7 days with the use of 2,4-D or dicamba formulations. The 40 L/ac spray volume will provide better control of wild oats, especially where there is a heavy crop canopy or dense growth of wild oats. Direct spray pattern 45° forward to enhance spray penetration. Agitation required to re-emulsify spray if allowed to stand for several hours.

9. **HOW IT WORKS:** A systemic, absorbed through leaves and translocated to the growing point. Cell elongation is inhibited and cell initiation and division is impaired. Wild oats are unable to compete with the crop because of stunting or death.
10. **EXPECTED RESULTS:** Initially a dark blue-green colour appears 10 days after spraying then the wild oats turn yellow and brown. Wild oats in the 1-2 leaf stage at application may often appear controlled but may escape and grow to maturity. Will be small, stunted plants with few shrivelled seeds.
11. **EFFECTS OF RAINFALL:** Rainfall within 2 hours of application will reduce effectiveness.
12. **MOVEMENT IN SOIL:** Half-life of 1-2 weeks in sandy loam, clay, and medium loam; 2-3 weeks in peat soil.
13. **GRAZING AND CROPPING RESTRICTIONS:**
Drift: Drift potential is low. Oats would be the most seriously affected crop.
Grazing Restrictions: Do not graze or harvest for forage in the year of treatment.
Crop Use After Hail: Do not graze or feed to livestock.
Succeeding Crops: No restrictions.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD 50 rats (mg/kg) = technical (1210), Metaven L (3,900). Eye irritant. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) plus goggles when handling this product. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Heated storage only.

MCPA (amine, ester, K and Na-salts)

Numerous Manufacturers

CAUTION POISON

1. **FORMULATIONS:**
Liquid: MCPA Amine (500, 80). Estemine MCPA, 500 g/L. 2 X 10 L jugs. MCPA Potassium (K) salt: MCPA K, 400 g/L.
Emulsifiable Concentrate: MCPA Ester (500, 80). 500 g/L.
Solution: Sodium (Na) salt: MCPA Sodium (Na) 300 g/L. 2 X 10 L, 20 L containers.
Solventless Ester: SEE MCPA.
2. **REGISTERED MIXES: Tank mix crops in brackets. Check the labels.**
MCPA Amine: Atolan F (barley, oats, wheat); Banvel (barley, canary seed, oats, spring rye, wheat); Buctril M (barley, oats, wheat); Glean (barley, oats,wheat); Hoe-Grass II (barley: **not** Belzes or Klages, spring rye, triticale, wheat); Laxone (chemical fallow); Pardner (barley, oats, wheat).
MCPA Ester: Avenge (barley, canary seed, Avenge wheat varieties); Avenge+Pardner (barley, Avenge wheat varieties); [Buctril M, Hoe-Grass II, Poast (see amine)]; Stampede 360 (wheat); [Sweep, Pardner (see amine)].
MCPA Potassium (K) Salt: [Banvel, Buctril M, Lorox L, Sweep, Pardner (see amine)].
MCPA Sodium (Na) Salt: [Buctril M, Sweep (see amine)].
Note: Some formulations can be mixed with liquid fertilizers (28-0-0).
Mixing Restrictions: Insure that the proper formulation of MCPA, **rate**, and order of mixing is used when tank mixing.
3. **CROPS:**

MCPA Amine	MCPA Ester	MCPA K-Salt	MCPA Na-Salt
Asparagus, barley (8.7), corn, flax (8.0), grasses (estab.), non-crop areas, oats (9.0), pasture (grass, estab.), peas [field (8.9), processing], rangeland, rye (fall, spring), turf (estab.), wheat [durum, hard red spring (8.7), winter (8.9)]	Asparagus, barley (8.0), flax, grasses (estab.), non-crop areas, oats (9.0), pasture (grass, estab.), rangeland, rye (fall, spring), wheat [durum, hard red spring (8.7), winter (8.9)]	Barley, corn, flax, oats, rye (fall, spring), wheat (durum, hard red spring, winter).	Barley, corn, flax, non-crop areas, oats, pasture (grass, estab.), peas [field (8.9), processing], rye (fall, spring), turf (estab.), wheat (durum, hard red spring, winter).

Underseeding: Do **not** use on crops underseeded to legumes.

estab.=established

4. WEEDS CONTROLLED:

MCPA Amine	MCPA Ester	MCPA K-Salt	MCPA Na-Salt
Group I burdock, clover (sweet), cocklebur, fireweed (7.1), kochia, lamb's-quarters (7.2), lettuce (prickly), mustards [ball, hare's-ear, Indian, tumble, wild (8.5), wormseed], pigweed (Russian), radish (wild), ragweeds (common, false, giant), shepherd's-purse, spurge, (thyme-leaved), stinkweed (7.5), sunflower (wild), vetch.	**Group I** burdock, clover (sweet), cocklebur, fireweed, kochia, lamb's-quarters (8.4), lettuce (prickly), mustards [ball, hare's-ear, Indian, tumble, wild (5.7), wormseed], pigweed (Russian), radish (wild), ragweeds (common, false, giant), shepherd's-purse, stinkweed (8.3), sunflower (wild), vetch.	**Group I** bluebur, burdock, cocklebur, fireweed, kochia, lamb's-quarters (8.5), lettuce (prickly), mustards (ball, hare's-ear, Indian, tumble, wild, wormseed), pigweed (Russian), radish (wild), ragweeds (common, false, giant), shepherd's-purse, stinkweed (8.3), sunflower (wild)	**Group I** burdock, cocklebur, fireweed, lamb's-quarters (8.5), lettuce (prickly), mustards (ball, hare's-ear, Indian, tumble, wild, wormseed), pigweed (Russian), radish (wild), ragweeds (common, false, giant), shepherd's-purse, stinkweed (8.3), sunflower (wild)
Group II bluebur, dragonhead (American), galinsoga (hairy), goosefoot (oak-leaved), mustards (dog, tansy), peppergrass (common, field), pigweed [redroot (6.5), tumble], pineappleweed, p. rsiene.	**Group II** bluebur, galinsoga (hairy), goosefoot (oak-leaved), mustards (dog, tansy), peppergrass (common, field), purslane.	**Group II** [illegible]tion, dock (curled), goat's-beard, mustards (dog, tansy), peppergrass (field), pigweed (prostrate, redroot), purslane, smartweeds (annual), sow thistle (annual), spurry (corn), wormwood (biennial)	**Group II** bluebur, buttercup (tall), dock (curled), galinsoga (hairy), goat's-beard, goosefoot (spear-leaved), mustards (dog, tansy), peppergrass, pigweed (redroot), purslane, smartweeds (annual).

5. WEEDS SUPPRESSED: (includes top growth control)

MCPA Amine	MCPA Ester	MCPA K-Salt	MCPA Na-Salt
Group I horsetail (field), plantain (common). **Group II** bindweeds (field, hedge), buckwheats [tartary wild (3.6)], dandelion, dock (curled), goat's-beard, gumweed, hemp-nettle (4.2), hoary cress, lettuce (blue), smartweeds (annual)(4.3), sow thistles (annual, perennial), spurge (leafy), thistle [Canada (5.8)], wormwood (biennial)	**Group I** horsetail (field), plantain (common). **Group II** bindweeds (field, hedge), buckwheats [tartary (4.3), wild (4.7)], dandelion, dock (curled), goat's-beard, gumweed, hemp-nettle (5.8), hoary cress, lettuce (blue), pigweed [redroot (4.4)], smartweeds (annual), sow-thistles (annual, perennial), spurge (leafy), thistle [Canada (4.5)], wormwood (biennial).	**Group I** horsetail (field), vetch. **Group II** bindweeds (field, hedge), buckwheats (tartary, wild), goosefoot, gumweed, hemp-nettle, hoary cress, lettuce (blue), sow thistle (perennial), thistle (Canada). Group III Spurge (leafy)	**Group I** horsetail (field) **Group II** bindweeds (field, hedge), buckwheats (tartary, wild), goosefoot, gumweed, hemp-nettle, hoary cress, knapweed (Russian), lettuce (blue), sow thistles (annual, perennial), spurge (leafy), thistle (Canada), wormwood (biennial).

6. WHEN USED:

Crop	MCPA Amine	MCPA Ester	MCPA K-Salt	MCPA Na-Salt
Asparagus	After cultivation just before spears appear. May repeat at end of cutting season.	After cultivation just before spears appear. May repeat at end of cutting season.	—	—
Barley, rye, wheat (spring).	3 leaf expanded to early flag leaf; milk stage to full maturity.	3 leaf expanded to early flag leaf; milk stage to full maturity.	3 leaf expanded to early flag leaf.	3 leaf expanded to early flag leaf.
Corn	Before 15 cm tall, after 15 cm, directed spray.	—	Before 15 cm tall, after 15 cm, directed spray.	Before 15 cm tall, after 15 cm, directed spray.
Flax	5 cm to early pre-bud.	5 cm to early pre-bud.	5 cm to early pre-bud.	5 cm to early pre-bud.
Grasses (estab.)	Before crop growth starts in spring.	Before crop growth starts in spring.	—	—
Oats	Up to flag leaf.	Up to flag leaf.	2-6 leaves	Up to flag leaf.
Pea (field, processing)	10-18 cm tall	—	—	10-18 cm tall
Rye (fall), wheat (winter), estab.=established	Before flag leaf in spring.	Before flag leaf in spring.	Before flag leaf in spring.	Before flag leaf in spring.

7. HOW TO APPLY:

With: Aircraft or Ground equipment.

Water Volume: Aircraft: 12 L/ac minimum. Ground: 40 L/ac; Peas: 70 L/ac minimum (amine), 60 L/ac minimum (Na Salt); Pasture, rangeland, turf: 180 L/ac.
Pressure: Air: 235 kPa or less; Ground: 200-275 kPa.
Rate: MCPA Alone. MCPA rate for tank mixes may be different.

Crop	MCPA Amine	MCPA Ester	MCPA K-Salt	MCPA Na-Salt
Asparagus	1.4 L/ac	1.4 L/ac	NRF*	NRF
Barley, oats, rye, wheat (Not underseeded)				
(Group I weeds).	280-445 mL/ac	280-445 mL/ac	375-505 mL/ac	485-710 mL/ac
(Group II weeds)	505-710 mL/ac	505-710 mL/ac	610-810 mL/ac	810-1200 mL/ac
(Group III weeds)	NRF	NRF	850 mL/ac	1.4-1.8 L/ac
Corn	Up to 445 mL/ac	NRF	505 mL/ac	Up to 705 mL/ac
Flax	Up to 445 mL/ac	Up to 445 mL/ac	605-850 mL/ac	Up to 705 mL/ac
Non-crop areas	1.0-2.0 L/ac	1.6 L/ac	NRF	2.85 L/ac
Pasture, rangeland, turf.	1.1-1.7 L/ac	0.6-1.1 L/ac	NRF	Legumes 710 mL/ac No legumes 2.85 L/ac
Peas	110-280 mL/ac	NRF	NRF	365-605 mL/ac

*No Recommendation Found.

Rate: MCPA used in tank mixes, if different from MCPA rate alone. Check the labels before you mix.

Tank Mix	MCPA Amine	MCPA Ester	MCPA K-Salt	MCPA Na-Salt
Buctril M	223 mL/ac	223 mL/ac	278 mL/ac	NR
Hoe-Grass II	28 mL/ac	28 mL/ac	NR	NR

*NR-Not Recommended.

8. **APPLICATION TIPS:**
Recommendations vary from label to label, read label of product used. Do not spray when air temperature is above 27°C. Extremely hard water may reduce performance or cause problems in spraying the product. Do not use on bentgrasses.
9. **HOW IT WORKS:** A systemic, absorbed by leaf and stem surfaces and translocated to the actively growing regions. MCPA disrupts cell division, causing abnormal growth response, thereby affecting respiration and food reserves.
10. **EXPECTED RESULTS:**
Weeds: Weeds start to twist between 2-20 days after spraying, depending on weather conditions, formulation and weeds. Following the twisting and bending, plants will turn brown and then die. Only emerged weeds will be controlled.
Crops: Yellowing and thinning of the crop may be noticed if higher than recommended rates are used. **Poor results may occur if** extremely hard water is used. Incorrect rate of MCPA is used in tank mixes.
11. **EFFECTS OF RAINFALL:** Rain within 2 hours of application will decrease activity.
12. **MOVEMENT IN SOIL:** Readily leached from soil. Longer residual in dry soil.
13. **GRAZING AND CROPPING RESTRICTIONS:**
Drift: Danger from drift with amine and salts is lower than from esters.
Grazing Restrictions: Do not graze or cut for greenfeed until 7 days after spraying.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (700-880). Low toxicity to fish.
15. **PRECAUTIONS, FIRST AID:** May cause burns upon contact with skin and eyes and it can be absorbed through the skin. Wear standard protective clothing (see page xx) to reduce exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** If frozen, warm to 5°C and mix well before using.

MECOPROP/COMPITOX (mecoprop)

United Agri Products/Rhône - Poulenc

CAUTION POISON

1. **FORMULATIONS:** Liquid; Compitox; 150 g/L; 4 L, 8 L containers, Mecoprop; 150 g/L; 10 L containers.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Barley (9.0), lawns, oats, turf, wheat [durum, spring)(8.7)].
Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**

buttercup	clover	ground ivy	plantain
chickweed (7.6)	dandelion	medic, black (Mecoprop only)	spurry, corn (7.3)
cleavers			

5. **WEEDS SUPPRESSED:** Canada thistle [top growth control (4.6)].
6. **WHEN USED:**
Crop: 3 leaf to early flag leaf.
Weeds: 2-4 leaf and mature plants.

7. **HOW TO APPLY:**
With: Ground equipment.
Rate: Cereals: 2.2-2.8 L/ac. Lawns, turf: 2.2-3.4 L/ac. Low rate for seedling weeds. High rate for mature weeds.
Water Volume: Cereals: 80-120 L/ac. Lawns, turf: 80-160 L/ac.
Pressure: 300 kPa.
8. **APPLICATION TIPS:** Recommended water volume is essential for optimum weed control. Cold weather and drought may cause a delay in weed control action. Do not spray bentgrass when temperatures are above 27°C, particularly if high rates are used.
9. **HOW IT WORKS:** A systemic, which disrupts the plant's translocation system causing the accumulation of plant food in the shoots and subsequent starvation of the roots.
10. **EXPECTED RESULTS:**
Weeds: Leaf curling and stem twisting should be visible within 4-5 days after spraying. Weeds should be dead within 3-4 weeks of application.
Crop: Deformed heads, missing florets, and twisted awns could result if recommendations are not followed or if crop is under stress conditions.
11. **EFFECTS OF RAINFALL:** Rain within 4-6 hours will reduce effectiveness.
12. **MOVEMENT IN SOIL:** Readily leached from soils. Longer residual in dry soil.
13. **GRAZING AND CROPPING RESTRICTIONS:**
Compitox: Do not graze within 14 days of application.
Crop Use After Hail: (Compitox only) No restrictions if 14 days after application.
Mecoprop: Not intended for crops grown for forage or hay. Do not feed Mecoprop treated fodder to livestock.
Drift: Danger of vapor drift is low.
Succeeding Crops: No restrictions.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (1,060).
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) to reduce exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store above 0°C. If stored for 1 year or longer, shake well before using.

MUSTER

DuPont

CAUTION POISON

1. **FORMULATION:**
Dry Flowable: 75%; 320 gram container.
2. **REGISTERED MIXES:** Poast
Surfactants: Agral 90, Agsurf , Citowett Plus.
Mixing Instructions: Add 1/2 - 3/4 required amount of water. While agitating, add Muster and ensure it is completely suspended. Complete filling, then add surfactant. Continuous agitation is required.
*When mixing with Poast, add it after Muster.
3. **CROPS:** Canola (spring).
4. **WEEDS CONTROLLED:**
Muster 8 g/ac
hempnettle, flixweed, mustard (wild)
Muster 12 g/ac
flixweed
hempnettle
mustard wild
smartweed, green
stinkweed
5. **WEEDS SUPPRESSED**
Muster 8 g/ac
smartweed, green
stinkweed
Muster 12 g/ac
pigweed, redroot
6. **WHEN USED:** Crop is at two leaf to the beginning of bolting. (For optimum control apply Muster at the cotyledon to six leaf stage of the target weeds).
7. **HOW TO APPLY:**
With: Ground equipment. Do not apply by air.
Sprayer Clean up: To avoid injury to susceptible crops thoroughly clean sprayer immediately after spraying. Ammonia must be used to deactivate Muster when cleaning equipment.

1. Drain tank and flush tank, boom and hoses with clean water for a minimum of ten minutes. Visually inspect tank to assure removal of all visible residues of Muster. If necessary, repeat step 1.
2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water to completely fill tank. Allow to sit for 15 minutes with agitation. Again flush the hoses, boom and nozzles with the cleaning solution and drain tank.
3. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
4. Repeat Step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

Caution: Do not use ammonia with chlorine bleach. Using ammonia with chlorine will release a gas with a musty chlorine odour which may cause eye, throat, and lung irritation.
Do not clean equipment in an enclosed area.
Do not clean sprayer near well or water source or near desirable vegetation.
Rate:
Muster alone: 8 - 12 g/ac (apply with 2 L/1000 L of surfactant).
Muster + Poast: 8 - 12 g/ac + 325-770 ml/ac. (Use surfactant as outlined on Poast label).
Water Volume: 40 L/ac.
Pressure: 210 - 275 kPa.
Nozzle: Flat fan recommended. Use 50 mesh screens or larger (metal or nylon).

8. **APPLICATION TIPS:** For optimum weed control apply Muster at the cotyledon to six leaf stage of the target weeds. For best control of stinkweed apply Muster plus surfactant on actively growing emerged stinkweed in the 1-4 leaf stage.
9. **HOW IT WORKS:** Absorbed by foliage and roots. Inhibits cell elongation.
10. **EXPECTED RESULTS:** Weed growth stops almost immediately. **Poor results may be expected if** improper mixing, timing, coverage, or when weeds are under drought stress.
11. **EFFECTS OF RAINFALL:** If rain occurs soon after application control may be reduced. At least 4-6 hours of dry weather are needed to allow Muster to be absorbed by weed foliage. Environmental conditions that slow the drying of Muster on the foliage such as high relative humidity, cool air temperature or cloud cover, may increase the time required.
12. **MOVEMENT IN SOIL:** Movement is restricted by fine textured soils, soil organic matter and neutral to acidic conditions.
13. **GRAZING AND CROPPING RESTRICTION:**
Minimum Crop Rotation Guidelines:
Minimum interval is that from the last application of Muster to date of planting the rotational crop.
Interval prior to planting (months after application):
10 months - spring wheat, durum wheat, barley, flax, oats.
22 months - canola, lentils, peas, fababeans, tame mustard. All other crops field bioassy at 22 months.
*Wherever Muster is used on land previously treated with Glean or Ally herbicide, read the rotational guidelines on both labels and follow the label with the longest interval stated for your situation.
14. **TOXICITY:** Low acute mammaliam toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (greater than 5000).
15. **PRECAUTIONS AND FIRST AID:** Wear standard protective clothing (see page xxx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a cool, dry place.
17. **RESISTANCE MANAGEMENT:** To delay selection of resistant weeds, rotate the use of Glean, Ally and Refine with other herbicides that are also effective on the same weeds.

NaTA (sodium TCA)

Hoechst

CAUTION POISON

1. **FORMULATIONS:** Pellets; NaTA Grass Killer; 85%; 25 kg bag.
2. **REGISTERED MIXES:**
NaTA: Buctril M (barley); MCPA Amine 500 [barley, flax, oats (8.9), peas], MCPA Sodium 300 (peas); 2,4-D Amine 500 (barley, flax, oats), Target.
Mixing Instructions:
NaTA pellets: Put at least 10 L of water in the tank for each kg of NaTA, agitate to dissolve. Ensure that NaTA is dissolved before adding another herbicide.
3. **CROPS:**

barley (9.0)	beets, sugar	flax (8.6)	oats (8.9)
beets, red	canola (8.7)	non-crop areas	peas, field only (7.0)

4. **WEEDS CONTROLLED:** Green foxtail (6.9), yellow foxtail (6.9).
5. **WEEDS SUPPRESSED:** Quackgrass, Kentucky bluegrass, smooth bromegrass.
6. **WHEN USED:** Foxtail: 1-3 leaf. Quackgrass: no stage limitation. Barley, canola, flax, oats: 2-4 leaf. Field peas: 10-20 cm tall. Sugar beets: post-emergent before 4 leaf. Red beets: pre-emergent. Flax: 10-15 cm tall.

7. **HOW TO APPLY:**
With: Ground equipment.
Water Volume: 40-60 L/ac.
Incorporation: For quackgrass cultivate or disc thoroughly after application.
Pressure: 275 kPa.
Nozzles: Flat fan nozzles, use minimum 50 mesh screens. Stainless steel nozzles are recommended because of corrosiveness.
Rate:

Crops	Pellets kg/ac	Non-Crop Areas	Pellets
Barley	0.5	Brome, Kentucky Blue (suppression)	5.0-7.0 kg/ac
Beets (red) pre	2.5-4.0	Pavement maintenance	2.5 kg/100 m^2
Beets (sugar) post	1.8	Quackgrass	44.5 kg/ac
Canola, flax, peas (field)	1.8	Quackgrass patches, undisturbed	100-125 g/10 m^2
Oats	0.5-1.1		

8. **APPLICATION TIPS:** Flush sprayer thoroughly after each use to prevent corrosion. Plant barley and oats at least 5 cm deep to avoid crop injury.
9. **HOW IT WORKS:** Absorbed more readily through roots than foliage. Precipitates proteins in the plants and disrupts the membranes.
10. **EXPECTED RESULTS:** Leaves die and plant dries up. Chlorosis, then browning of the leaf tips, growth retardation and eventual death. **Poor results may be expected if** the soil is dry at application time and for a 2-3 week period after, or there is inadequate mixing.
11. **EFFECTS OF RAINFALL:** A light rain after application is beneficial for activation. Heavy rain may wash TCA off foliage
12. **MOVEMENT IN SOIL:** Movement is greater in sandy soils.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not feed tops of sugar or red beets to livestock. Do not allow animals to graze treated areas for at least 24 hours after treatment.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = sodium salt (3,300-5,000). Skin and eye irritant. Non-toxic to birds and fish.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) plus goggles and gloves to reduce exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention
16. **STORAGE:** Dry storage, no effect from freezing. A minimum of 2 years shelf life.

NORTRON (ethofumesate)

Nor-Am

1. **FORMULATIONS:** Emulsifiable Concentrate: 180 g/L; 20 L cans.
2. **TANK MIXES:** Ro-Neet, TCA.
3. **CROPS:** Sugarbeets.
4. **WEEDS CONTROLLED:**

Barnyard grass	Purslane
Foxtail	Redroot
Kochia	Shepherd's purse
Lady's thumb	Volunteer barley and oats
Lamb's quarters	Volunteer wheat
Pigweed	Wild oats

5. **WEEDS SUPPRESSED:** Wild buckwheat, Russian thistle, black nightshade.
6. **WHEN USED:** Nortron may be fall-layered, spring-applied before planting and pre-emergence.
7. **HOW TO APPLY:** Ground equipment.
Rate: Dependent upon soil type - 3.4 L - 8.9 L per acre broadcast 1.1 - 3.0 L per acre applied on an 18 cm band/55 cm row.
Water Volume: 44-222 litres per acre.
Pressure: Apply Nortron to the soil using standard low pressure (150-350 kPa) spray equipment.
Nozzles: Do not use smaller than 50 mesh strainer nor less than an 8002E nozzle orifice.
8. **APPLICATION TIPS:** Apply Nortron before or at planting time and incorporate into the soil to a depth of 2.5 to 5.0 cm. Deeper incorporation may reduce effectiveness. Nortron may be applied pre-emergence at the time of planting or shortly after, but prior to weed emergence.

Incorporation Equipment: Hooded-power or ground-driven rotary tillers, rolling cultivators and harrows are most effective for incorporating Nortron into the soil. Do not apply Nortron through soil injector shanks. Large clods can reduce the effectiveness of Nortron. All existing vegetative growth should be thoroughly worked into the soil before treatment. Do not allow spray mixture to stand in tank overnight. Do not use Nortron in water having a temperature below 5°C as crystallization of spray mixture may occur in the nozzles and strainers.

9. **HOW IT WORKS:** Uptake of ethofumesate occurs primarily via the emerging shoot as it passes upwards through treated soil; however, for certain broadleaf species, root uptake is more important. Ethofumesate is non-volatile and in all cases uptake occurs from aqueous solution.
10. **EXPECTED RESULTS:** Nortron, applied pre-plant incorporated, with proper activation, will normally not permit weed emergence. If emergence should occur, uptake has occurred, seedling will show loss of vigor and eventual death.
11. **EFFECTS OF RAINFALL:** Normally 1.5 cm of rainfall is sufficient to activate Nortron. In areas where moisture can be marginal, incorporation is recommended.
12. **MOVEMENT IN SOIL:** Under normal conditions, ethofumesate is only slowly leached from the soil surface, and most of the material remains concentrated in the upper 15 cm.
13. **GRAZING AND CROPPING RESTRICTIONS:** Where Nortron is used in combination with TCA, do not use treated sugar beet tops for feed or forage. Do not rotate with any crops other than sugar beets for 12 months after application. Thorough tillage, including moldboard plowing, should precede the planting of crops other than sugar beets. Do not use Nortron on muck or peat soils. If crop is lost due to climatic or soil conditions following application of Nortron do not plant crops other than sugar beets in Nortron-treated land during the same season. If fields are replanted to sugar beets, reseed into treated band. Do not retreat field with Nortron.To reduce injury to rotational crops following a droughtly sugar beet season, Nortron should be applied only in a band, and field should be moldboard plowed after harvest.Wheat and barley may be injured if planted following a droughtly sugar beet year.
14. **TOXICITY:**

E.C. formulation:	
Acute oral LD_{50} (rat):	5,560 mg/kg.
Acute dermal LD_{50} (rat):	> 4,000 mg/kg.
Technical material:	
Acute oral LD_{50} (rat):	6,400 mg/kg.
Acute oral LD_{50} (bobwhite quail):	> 8,343 mg/kg.
Acute dermal LD_{50} (rat):	> 1,440 mg/kg.
Dietary LD_{50} (mallard duck):	> 10,000 mg/kg.
Toxic to fish	

15. **PRECAUTIONS AND FIRST AID:**
Danger: Eye irritant. Causes eye or skin irritation. Do not get in eyes, on skin, or on clothing. Harmful if swallowed. **Avoid inhalation of fumes.** Wear standard protective clothing (see page xx) and goggles to reduce the skin and eye contact. **If in eyes or on skin** use standard first aid measures (see page xxiii). If swallowed seek medical attention. This product contains petroleum distillates. **If swallowed**, drink promptly a large quantity of milk, egg whites, gelatin solution, or if these are not available, drink large quantities of water. Avoid alcohol. **Do not induce vomiting.** Call a doctor immediately. If patient is unconscious, give him air.
Environmental Hazards: Keep out of lakes, ponds, or streams. Do not contaminate water by cleaning of equipment or disposal of wastes.
16. **STORAGE:** Do not use or store near heat or open flames. Store **Nortron** in a cool place, above 0°C.

PARDNER (bromoxynil)

Rhône - Poulenc

WARNING POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 280 g/L; 8 L jug.
2. **REGISTERED MIXES:** Atrazine (corn); Avenge or Avenge+MCPA ester (barley, Avenge wheat varieties); Glean (barley, spring wheat); Hoe-Grass 284 [barley (**not** Betzes or Klages), seedling grasses (brome, creeping red fescue, crested and intermediate wheatgrass, Russian wild ryegrass), spring wheat]. MCPA (amine, ester, K-Salt)(barley, oats, wheat, canary seed, seedling grasses, fall rye); Roundup (chemical fallow); 2,4-D (amine, ester)(barley, wheat); MCPA + NaTA (barley, oats).
Mixing Restrictions: Add Atrazine; MCPA; or 2,4-D to water first, then Pardner. Ensure Glean is completely suspended before adding Pardner; no surfactant needed.

3. CROPS:

Underseeding: Legumes not recommended.

barley (9.0)	oats (8.8)	**Seedling grasses for seed production**	reed canary grass (8.3)
canary seed (9.0)	rye, fall	bromegrass (8.7)	timothy (8.8)
corn, field (9.0)	triticale (9.0)	fescue [creeping red (8.6),	wheatgrass (crested (8.3),
corn, sweet (8.3)	wheat [durum, spring,	meadow (8.3)]	intermediate, slender, tall]
	winter (8.9)]	orchard grass (8.6)	wild rye, Russian (8.9)

4. WEEDS CONTROLLED:

bluebur	cockle, cow (6.9)	lady's-thumb	ragweed, common
buckwheat (common	cocklebur	lamb's-quarters (8.4)	smartweeds, annual (8.1)
tartary, wild)(8.4)	groundsel, common (9.0)	mustard, wild (8.5)	stinkweed (8.4)
catchfly, night-flowering (8.0)	knawel (7.7)	nightshade (American, black)	thistle, Russian (8.4)
chamomile, scentless (7.6)	kochia (8.2)	pigweed, redroot* (7.9)	

*Triazine resistant.

5. WEEDS SUPPRESSED: None.

6. WHEN USED:

Weeds: Seedling to 4 leaf stage except Russian thistle to 5 cm tall. Generally best results if weeds are in seedling stage. To control scentless chamomile and knawel, spray before 3 leaf stage.

Crops: Barley, canary seed, corn (field, sweet), oats, triticale, wheat: 2 leaf to early flag leaf. 2,4-D Mix on wheat or barley after 4 leaf. Winter wheat, fall rye: first growth to early flag leaf. Corn: Pardner alone or Atrazine Mix: until crop is 25 cm tall. Canary seed: 3-5 leaf. Seedling grasses, grown for seed production: 2-4 leaf.

7. HOW TO APPLY: Ground equipment or Aircraft (wheat and barley only). Spra-coupes: not recommended.

Water Volume: 40 L/ac. Corn: 60 L/ac; 8 L/ac (air).

Pressure: 275 kPa.

Nozzles: Flat fan nozzles recommended or Hollow cone (air only).

Rate:

Crop	**Pardner**	
Barley, corn (field, sweet), oats, triticale, wheat.	405-485 mL/ac	
Canary seed	405 mL/ac	
Rye (fall), wheat (winter).	405-485 mL/ac	
Seedling grasses (grown for seed production only)	405-485 mL/ac	
Broadleaf weeds and wild oats (1-4 leaf).	405 mL/ac	Hoe-Grass 284 at 1.13 L/ac

8. APPLICATION TIPS: Avoid spraying crops during adverse growing conditions especially drought, high temperatures (over 29°C) or in high humidity. Observe all Glean precautions (with Glean mix), including soil pH limits and crop rotations.

9. HOW IT WORKS: A contact herbicide so good coverage is essential. Inhibits respiration and photosynthesis causing death.

10. EXPECTED RESULTS:

Weeds: Turn brown and die within 3-5 days - more rapid under good growing conditions and when applied to seedling weeds. **Poor results can be expected if** weeds past 4 leaf stage, poor spray coverage or, lower than recommended rate used. Injury to corn may occur if under stress.

11. EFFECTS OF RAINFALL: None.

12. MOVEMENT IN SOIL: None.

13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or harvest for green feed until 56 days after treatment.

Succeeding Crops: No restrictions.

14. TOXICITY: Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (440). Very toxic to fish.

15. PRECAUTIONS, FIRST AID: Intake of a large dose may cause convulsions, sudden collapse and coma. Can be absorbed through the skin. Wear standard protective clothing (see page xx) when applying. **If in eyes or on skin** use standard first aid measures (see page xxiii).

Symptoms of acute poisoning: Stomach cramps, diarrhea, sore throat may appear. **If swallowed** seek medical attention.

16. STORAGE: Do not freeze. Store in heated storage.

PATORAN (metobromuron)

BASF

1. **FORMULATIONS:** Liquid Suspension; Patoran FL; 400 g/L; 10 L jug.
2. **REGISTERED MIXES:** Dual Ciba-Geigy 960E (potatoes).
   Mix Restrictions: Not compatible with emulsifiable concentrates.
3. **CROPS:** Beans [dry (kidney, white, yellow-eye), adzuki, lima, snap (except Slim Green)], potatoes, soybeans.
4. **WEEDS CONTROLLED:**

barnyard, grass	groundsel	nightshade, black	shepherd's-purse
bluegrass, annual	lady's-thumb	pigweeds	smartweeds, green
chickweed	lamb's-quarters	purslane	spurry, corn
foxtail, green	mustards	ragweed	stinkweed.

5. **WEEDS SUPPRESSED:** Annual grasses.
6. **WHEN USED:** Post-plant but pre-emergent to crop and weeds. Patoran can be applied either as:
   (a) A pre-emergent spray in tank mix combination with Dual Ciba-Geigy.
   (b) A pre-emergent spray preceded by a pre-plant incorporated spray of Dual Ciba-Geigy.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Water Volume: 100-160 L/ac.
   Incorporation: Do not soil-incorporate Patoran.
   Pressure: 275 kPa.
   Nozzles: Nozzle screens should be 50 mesh or larger.
   Rate:

Crop	Sandy Loam Soils L/ac	Clay, Muck Soils L/ac
Beans (adzuki)	1.7	1.7-2.2
Beans (dry, lima, snap)	1.4	1.7
Potatoes	1.7-2.2	2.2-2.8; 3.4 on mucks with grass problems.
Soybeans	1.7	1.7-2.2

   Do not use on the bean variety Slim Green. Use 1.1 L/ac for the bean varieties: Yellow-Eye Cranberry, White Kidney, Light-Red Kidney, and Dark-Red Kidney.
8. **APPLICATION TIPS:** Do not let spray tank mixture stand without agitation before use. Keep by-pass line on or near the bottom of spray tank to prevent foaming. Do not apply Patoran to sandy soils of less than 2% organic matter.
9. **HOW IT WORKS:** Absorbed through the roots, inhibits photosynthesis.
10. **EXPECTED RESULTS:** Weed emergence will be inhibited or absent. Under dry conditions, some weed emergence and early die back can occur.
11. **EFFECTS OF RAINFALL:** Enhance efficacy. Shallow planted crops may be injured if heavy rain follows application.
12. **MOVEMENT IN SOIL:** Patoran can be leached on light soils.
13. **GRAZING AND CROPPING RESTRICTIONS:**
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (2,600). Non-toxic to fish and birds. Slightly toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) to reduce skin exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention.
16. **STORAGE:** Flowable formulations should be kept in warm storage. If frozen, warm thoroughly then agitate to resuspend.

POAST (sethoxydim)

BASF

CAUTION POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 184 g/L; 2 X 7 L Poast + 1 X 7 L Assist Oil Concentrate; 1 X 14 L Poast + 1 X 7 L (or 8.9 L) Merge Adjuvant; 200 L drum Poast.
2. **REGISTERED MIXES:**
   Canola: Lontrel, Muster (Poast/Assist only), Bladex Liquid (triazine tolerant canola only).
   Flax: Buctril M, MCPA (amine, ester), Pardner.
   BASF Power Pack: (2 X 10.6 L liquid ammonium sulphate + 3.4 L Assist).
   Mixing Instructions: Do not use ammonium sulphate in broadleaf tank mixes (except with Muster). Use annual grass rates (groups A, B or C) only in Poast tank mixes.

Usual Mix Order	Mix Order Exceptions	
1) Poast,	1) Bladex Liquid,	1) Ammonium sulphate,
2) Broadleaf herbicide,	2) Poast,	2) Poast,
3) Assist or Merge	3) Assist or Merge.	3) Assist.

3. **CROPS:** Alfalfa (seedling and established), beans [adzuki, dry common, faba, lima, mung, snap, common (9.0)], buckwheat, caraway, coriander, cucumbers* (8.9), dill, flax (9.0), forage legumes for seed (seedling and established: alfalfa, alsike clover, cicer milkvetch, sainfoin, sweet clover), garlic, lentils (9.0), creeping red fescue (seed production only), onions [dry bulb (8.8)], peas [dry, fresh, processing (9.0)], potatoes (9.0), rapeseed [including canola (9.0)], soybeans (9.0), sugar beets (9.0), tomatoes.

4. **WEEDS CONTROLLED:**

barley, volunteer (8.5)	grass [barnyard (8.6), crab,	panicum, fall
corn, volunteer (7.0)	quack (6.0)*, witch]	proso millet, wild
darnel, Persian (8.7)	oats (volunteer, wild)(8.4)	wheat, volunteer spring (8.4)
foxtail [green (8.3), yellow]		

*Season-long control.

5. **WEEDS SUPPRESSED:** None.

6. **WHEN USED:** Controls weeds in 1-6 leaf stage, optimum is 2-5 leaf (10-15 cm tall). Quackgrass up to 3 leaf (8-12 cm tall).

7. **HOW TO APPLY:**

With: Aircraft or Ground equipment.
Water Volume: Air: 10-20 L/ac. Ground: 20-45 L/ac. Dense foliage, heavy infestations and for quackgrass control 45-80 L/ac.
Pressure: Air: 200 kPa. Ground: 240 kPa with low water volumes; 275-425 kPa with higher water volumes.
Nozzles: Flat fan only. Tilt forward 45° for better coverage. The use of flood jet or hollow cone nozzles is not recommended, because of uneven and inadequate spray coverage.
Rate:

Rates of Poast/Assist

Weeds	Poast/ac*	Assist L/ac In 20-44 L Water	45-80 L	Ammon. Sulph*** L/ac
Group A:				
Barnyard grass, crabgrass, fall panicum, foxtail, Persian darnel, proso millet, volunteer corn, witchgrass.	325 mL**	0.2-0.4	0.8	
Heavy infestation of above weeds.	405 mL	0.2-0.4	0.8	
Group B:				
Wild oats + weeds in Group A.	570 mL	0.2-0.4	0.8	
Heavy infestation of wild oats.	650 mL	0.2-0.4	0.8	
Group C:				
Volunteer barley, volunteer spring wheat, volunteer oats + weeds in Group A+B	650 mL	0.2-0.4	0.8	
Heavy infestation of volunteer barley.	770 mL	0.2-0.4	0.8	
or				
Volunteer cereals, wild oats + weeds in Group A+B (Do not use on buckwheat)	570 mL	0.4	0.8	1.6
Group D:				
Quackgrass + weeds in Group A-C.	1.78 L	0.8	1.6	
or				
Quackgrass + weeds in Groups A-C. (for flax, potatoes, soybeans, lentils, rapeseed, fescue and alfalfa).	1.09 L	- -	0.8	1.6

Do not use quackgrass rate on buckwheat.

Note: **1 repeat of 325 mL/ac if necessary for second flushes: only on onions, soybeans, sugar beets.
***BASF Power Pack (2 X 10.6 L liquid ammonium sulphate + 3.4 L Assist); Do not use ammonium sulphate in broadleaf tank mixes (except with Muster).

Rates of Poast/Merge

Weeds	Poast/ac*	Merge L/ac	
		In 20-44 L Water	45-80 L Water
Group A:			
(Described in Poast/Assist Rates Table).	325 mL	0.2-0.4	0.4
Heavy infestations of grasses.	405 mL	0.4	0.4
Group B:			
Wild oats and volunteer cereals + grasses in Group A.	570 mL	0.2-0.4	0.4
Heavy infestation of grasses. (Do not use this rate on buckwheat).	650 mL	0.4	0.4
Group C:		**(Ground Application Only)**	
Quackgrass + grasses in Groups A + B (Do not use this rate on buckwheat).	1.09 L	0.4-0.8	0.4-0.8

*For band application adjust rate per acre in relation to the band width (annual grasses only).
**For aerial application 10-20 L/ac of water and 0.1-0.2 L/ac of Merge are recommended.

8. **APPLICATION TIPS:** Treat when weedy grasses are actively growing, there is good soil moisture and crop is small enough to permit thorough spray coverage. If annual grass weeds and broadleaf weeds are not in the correct stages for treatment, apply separate applications of each herbicide. Control of grasses growing under drought, flooding or prolonged cool temperatures under 15°C, may be reduced or delayed. Escapes or re-tillering may occur under prolonged stress conditions or low fertility. **Do not apply on grasses stressed longer than 20 days due to lack of moisture as unsatisfactory control can result.** Thorough pre-plant tillage operations are required to fields where sod or forage grass crops may have grown in the previous year. For quackgrass only on cultivated land, pre-plant tillage will fragment rhizomes and improve control. Crop competition generally enhances control of quackgrass. In wide row crops the quackgrass treatment should be followed by a cultivation after a minimum 7 days. Do not apply where runoff or erosion is likely. Allow 4 days between application of Poast and any other chemical not recommended as a tank-mix combination. Ammonium sulphate is corrosive to metal. Do not allow mixtures to stand. Thoroughly clean sprayer after use by flushing with water and detergent.
9. **HOW IT WORKS:** Poast is a contact and a systemic herbicide. Absorbed primarily by foliage and translocated to the growing points. Inhibits certain vital metabolic processes in these tissues. Thorough coverage of the foliage is important for consistent grass control.
10. **EXPECTED RESULTS:** Susceptible grasses stop growing immediately, gradually turn yellow and then brown. The time required for complete control is normally 7-21 days (annual grasses). Control of quackgrass develops more slowly than control of annual grasses. Poast is translocated through the quackgrass plant to the rhizomes and kills actively growing rhizome buds, as well as above ground vegetation. Dormant rhizome buds will remain unaffected by the spray and regrowth can occur from these buds. The regrowth will not be significant until 6-8 weeks after treatment, depending on growing conditions, crop cultivation practices and crop competition.
11. **EFFECTS OF RAINFALL:** Rainfall within 1 hour of application may reduce effectiveness.
12. **MOVEMENT IN SOIL:** Relatively immobile, breaks down rapidly in soil.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze treated fields or harvest for feed prior to crop maturity.
Succeeding Crops: Allow a minimum of 14 days between application and re-planting of cereal or grass crop. A cultivation to a minimum depth of 10 cm is 7 days prior to seeding. Otherwise no restriction.
Spray to Harvest Interval (Days): Alfalfa (70), beans [snap (56), common (60), white, kidney, pinto (80), adzuki, faba, lima, mung (80)], buckwheat (85), cucumbers (30); flax (60), garlic (50), lentils (65), onions (50); peas [fresh (30), processing (30), dry (60)], potatoes (80), rapeseed (70), soybeans (80); sugar beets (85), tomatoes (60).
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = formulation (2,500). Causes moderate skin and eye irritation. Low toxicity to birds, fish and bees. Hazards to the environment are low because of rapid breakdown in soil.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) plus goggles and gloves to reduce skin and eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention immediately for eyes. **If swallowed** seek medical attention.
16. **STORAGE:** Store product in a cool, dry place. Freezing will not reduce effectiveness.

POAST C.T. (sethoxydim + clopyralid)

BASF

CAUTION POISON

1. **FORMULATION:** Emulsifiable Concentrate; 184 g/L sethoxydim + 200 g/L clopyralid; split jug: 5.6 L sethoxydim + 3.0 L clopyralid + 4 L Assist Oil Concentrate.
2. **REGISTERED MIXES:** None.
Mixing Instructions:
1. Fill clean spray tank with one half of the intended water to be used; start agitation.

2. **Empty entire content of Poast CT container** into the spray tank to ensure uniform tank mixing.
3. Add Assist Oil Concentrate (0.4 L/ac).
4. Add remaining quantity of water to obtain total desired volume. Continue to agitate.
5. After any break in the spraying operation, agitate thoroughly before spraying again. **Do not allow the mixture to sit overnight**. Settling will occur if agitation is not continuous.

3. **CROPS:** Canola (rapeseed).

4. **WEEDS CONTROLLED:**
fall panicum
foxtail (green, yellow)
grass (barnyard, crab, witch)
oats, wild
persian darnel
proso millet
thistle, Canada
volunteer corn

5. **WEEDS SUPPRESSED:**
buckwheat, wild
scentless chamomile
sowthistle, perennial

6. **WHEN USED:** Rapeseed (canola) 3-6 leaf. Canada thistle rosette to pre-bud stage and actively growing. Annual grasses 1-6 "true leaf" stage, optimum is 2-5 leaf (10-15 cm) and actively growing.

7. **HOW TO APPLY:**
With: Ground equipment. Do not apply by air.
Water Volume: 40-80 L/ac.
Pressure: 275 kPa.
Nozzles: Flat fan nozzles, tilt forward 45 degrees for better coverage. **The use of flood jet or hollow cone nozzles is not recommended, because of uneven and inadequate spray coverage.**
Rates: The contents of this container will treat 10 acres. **Empty the entire contents of this container**. Add Assist Oil Concentrate at a rate of 0.4 L/ac with the contents of Poast CT.

8. **APPLICATION TIPS:** Thoroughly clean the sprayer by flushing the system with water containing detergent. Trace contamination of the spray solution with 2,4-D, MCPA or similar herbicides will result in damage to rapeseed (canola). Best results are obtained when annual grasses and Canada thistle are actively growing and soil moisture is adequate for rapid growth and crop is small enough to permit thorough spray coverage. Under dry soil conditions and poor growing conditions, control of Canada thistle may be severely reduced. Applications made after the flowering stage of Canada thistle will not provide satisfactory control. Control of grasses growing under drought, flooding or prolonged cool temperatures under 15°C, may be reduced or delayed. Escapes or retillering may occur under prolonged stress conditions or low fertility. **Do not make applications to grasses stressed longer than 20 days due to lack of moisture as unsatisfactory control can result.** Thorough pre-plant tillage operations are required to fields where sod or forage grass crops may have grown in the previous year. **Do not** mix or apply this mixture with any other additive, pesticide or fertilizer, except as recommended on the label. Allow 4 days between application of Poast CT and any other chemical.

9. **HOW IT WORKS:** Absorbed primarily by foliage and rapidly translocated. Thorough coverage of the foliage is important for consistent control.

10. **EXPECTED RESULTS:**
Annual Grasses: Stop growing immediately, gradually turn yellow and then brown. The time required for complete control is normally 7-21 days.
Canada Thistle: Growth will first slow then cease. Top growth control may not occur until 14-21 days after treatment. For low to medium (less than 10 plants per square metre) infestations of Canada thistle, this product will provide top growth control for 6-8 weeks. Some regrowth may occur by the end of the season but this will not interfere with the harvesting of the crop.

11. **EFFECTS OF RAINFALL:** Rainfall within one hour of application may reduce the control of annual grasses. A rain free period of 4-6 hours is required for sufficient top growth control of Canada thistle.

12. **MOVEMENT IN SOIL:** Sethoxydim is relatively immobile and breaks down rapidly in the soil. Clopyralid is somewhat soluble in water, but is generally not mobile in soil under typical prairie conditions.

13. **GRAZING AND CROPPING RESTRICTIONS:**
Grazing Restrictions: Do not graze treated fields or harvest for feed prior to crop maturity.
Drift: Injury to sunflowers, legumes, fruit or vegetable crops, flowers or other desirable broadleaf plants as well as grass, cereal or corn crops and turf may occur if Poast CT is applied directly on or is allowed to drift onto these susceptible crops. Do not apply when weather conditions may cause spray drift from treated fields to adjacent crops.
Succeeding Crops: Fields previously treated with Poast C.T. herbicide can be seeded to wheat, oats, barley, rye, flax, canola, or should be summer fallowed the year after treatment. Do not seed to crops other than those listed above the year following treatment. Allow a minimum of 14 days between application of Poast C.T. and replanting of cereal or grass crops. A cultivation to a minimum depth of 10 cm is recommended 7 days prior to seeding. Spray to harvest interval (days): Canola and rapeseed (70).

14. **TOXICITY:**
Sethoxydim: Low acute mammalian toxicity. Acute oral LD50 rats (mg/kg) = formulation (2500). Causes moderate skin and eye irritation. Low toxicity to birds, fish and bees. hazards to the environment are low because of rapid breakdown in soil.
Clopyralid: Very low acute mammalian toxicity. Acute oral LD50 rats = 5000 mg/kg. Acute oral LD50 bees = 100 ug/bee. Extremely low toxicity to fish.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page XX) plus goggles and gloves to reduce skin and eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention immediately for eyes. **If swallowed** seek medical attention.
16. **STORAGE:** Store in original, tightly-closed container. Do not ship or store near food, feed, seed or fertilizers. Store in cool, dry, locked, well-ventilated area without floor drain. Store in heated storage in winter. Should product freeze, warm to room temperature and shake well before using.

PRIMEXTRA (metalachlor + atrazine)

Ciba-Geigy

1. **FORMULATIONS:** Flowable; 300 g/L metolachlor + 190 g/l atrazine + 10 g/L related active triazines; 2 X 10 L pack.
2. **REGISTERED MIXES:** Banvel. Nitrogen fertilizer solutions may replace all or part of the water carrier. Dry granular phosphate fertilizers may be impregnated with Primextra.
3. **CROPS:** Corn (field, silage, sweet).
4. **WEEDS CONTROLLED:**

barnyard grass	lamb's-quarters	purslane
buckwheat, wild	mustard, wild	ragweed
foxtail (green, yellow)	nightshade, American	smartweeds, annual
lady's-thumb	pigweed (prostrate, redroot)	

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Spring applied: pre-plant incorporated or banded. Pre-emergent (under irrigation only).
7. **HOW TO APPLY:**
With: Ground equipment.
Rate: 2.6-3.4 L/ac. Infestation Level: Light 2.6 L/ac; Medium 2.9 L/ac; Heavy 3.4 L/ac.
Water Volume: 60-120 L/ac.
Incorporation: Broadcase and lightly harrow before planting. Do not exceed 5 cm depth. Band treatment: mount a press wheel ahead of the nozzle to level the band.
Pressure: 200-300 kPa.
Nozzles: Use metal filters and screens 50 mesh or larger.
8. **APPLICATION TIPS:** Dry granular fertilizer may be impregnated for pre-plant, incorporated application.
9. **HOW IT WORKS:** Absorbed by roots and inhibits photosynthesis.
10. **EXPECTED RESULTS:** Weeds die at germination or under dry conditions die-back soon after emergence.
11. **EFFECT OF RAINFALL:** Enhances results.
12. **MOVEMENT IN SOIL:** Negligible lateral movement.
13. **GRAZING AND CROPPING RESTRICTIONS:** Follow corn with corn only.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = atrazine (3,080), metolachlor (2,780), Primextra (4,680). May cause severe skin irritation and perhaps eye injury. Low toxicity to fish and birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake may cause convulsions and coma.
16. **STORAGE:** Dry heated storage preferred.

PRINCEP NINE-T/SIMAZINE 80W (simazine)

Ciba-Geigy/United Agri Products

1. **FORMULATIONS:** Water Dispersible Granule, Princep Nine-T; 89% simazine + 1% related triazines; 5 X 5 kg bag. Wettable Powder, Simazine 80W; 79% simazine + 1% related triazines; 2 kg, 5 kg.
2. **REGISTERED MIXES:** None.
3. **CROPS:**

alfalfa, established*(8.5)	raspberries
asparagus	shelterbelts, established*
blueberries, high bush	tree plantings (forest, Christmas)
corn (field, sweet)	trefoil, bird's-foot (established)
nursery stock, established*	woody ornamentals, established

*Established-at least 1 year old.

4. **WEEDS CONTROLLED:**

buckwheat, wild	grass, barnyard	oats, wild	smartweeds, annual
clovers, volunteer	lady's-thumb	purslane	most perennial species
foxtail, yellow	lamb's-quarters	ragweed	starting freshly from seed

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Prior to weed emergence. May be applied in either the spring or fall, prior to freeze-up.
   Alfalfa, bird's-foot trefoil: Late fall.
   Asparagus, blueberries: Early spring.
   Corn: Within 3 days of seeding.
   Raspberries: Early spring but not on young shoots.
   Shelterbelts (established): Fall or in spring prior to weed emergence.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Water Volume: 120 L/ac. Shelterbelts: 200 L/ac.
   Incorporation: In corn, Princep or Simazine 80W may be applied 1 week before seeding and incorporated to a depth of 2.5 cm.
   Pressure: 275 kPa.
   Nozzles: Use nozzle screens of 50 mesh or larger.
   Rate: (On Established Stands Only: at least 1 year old)

Crop	Quantity/ac Princep Nine-T	Quantity/ac Si:nazine 80W
Alfalfa	0.45 kg	0.61 kg
Bird's-foot trefoil	0.45 kg	0.61 kg
Asparagus, blueberries, Nursery stock, woody ornamentals	1 - 1.5 kg	1.11 - 1.72 kg
Christmas tree and woodland plantations (2-year stock or older)	2 - 2.8 kg	2.23 - 3.34 kg
Corn	0.6 - 1 kg	0.80 - 1.10 kg
Raspberries	0.8 - 1 kg	0.9 - 1.1 kg
Shelterbelts	2 - 3kg	2.23 - 3.34 kg

8. **APPLICATION TIPS:** Gentle agitation required during mixing and spraying. After any break in the spray application, agitate thoroughly. Do not overlap application. Alfalfa, bird's-foot trefoil: Do not apply to the same field for more than 3 consecutive years. Do not apply Gramoxone within 1 year after the Princep or Simazine 80W application.
9. **HOW IT WORKS:** Acts through the roots of germinating weeds and inhibit photosynthesis.
10. **EXPECTED RESULTS:** Weed-free ground.
11. **EFFECTS OF RAINFALL:** Negligible.
12. **MOVEMENT IN SOIL:** Very little movement is possible on clay soil but on sandy ground with high rainfall some leaching may occur.
13. **GRAZING AND CROPPING RESTRICTIONS:** Allow 30 days between application and grazing of dairy, beef cattle, and sheep and 60 days between application and cutting for hay.
    Succeeding Crops: Plant only corn in the treated area in the same year. Breakdown of simazine in the soil is slow and may cause injury to sensitive crops (e.g. cereals, canola, sugar beets, white beans, onions, peas, tomatoes, turnips) one or more years after application. The risk of damage to succeeding crops from simazine residues may be reduced by ploughing or deep tilling treated fields in the fall prior to seeding the next crop in the rotation. Spreading and incorporating manure may also help to reduce the simazine levels. Uneven application, excessive sprayer overlap or applications in excess of recommended rates will result in a longer carryover of simazine residues. A prolonged period of hot dry weather will also lengthen the time that simazine residues remain in the soil.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (5,000), Princep Nine-T (5,000). May be irritating to eyes and cause dermatitis.

15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles when using. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in dry area, heating not required.

PRONONE 10G (hexazinone)

United Agri Products

CAUTION FLAMMABLE

1. **FORMULATION:** Pronone 10G, granular, 10% hexazinone.
2. **REGISTERED MIXES:** None.
3. **CROPS:** For woodland management areas; black spruce, white spruce, red pine.
4. **WEEDS CONTROLLED:**
   brome (grass)
   blue joint grass
   goldenrod
   Brush:
   raspberry
   trembling aspen
   balsam popular
   *cherry
   *white birch
   *(controls seedlings up to 120 cm).
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Conifer site preparation.
   Spring, after ground has thawed.
   Fall, apply up to freeze up.
7. **HOW TO APPLY:** Ground application only.
   With: Apply only with certified equipment. Consult with United Agri Products for these equipment types. Granular fertilizer applicators are not specifically designed to apply rates as labelled.
   Rate: 8 kg/ac - 16 kg/ac.
   Black spruce, white spruce, red pine may be planted immediately after application at the 8 kg/ac rate only. At rates above 8 kg/ac the above species should not be planted until a year after application. Use the higher rate on fine textured soils high in organic matter and for hard-to-kill species. For intermediate textured soils, use the lower rate. On all soils, the higher rate will provide longer residual control. Do not use on gravelly soils, rocky soils or soils which are sandy or coarse textured. Gravelly soils are soils having more than 70% by volume of coarse fragments (gravel, cobbles, or stones) with too little fine fraction to fill a space larger than 1 mm. Rocky soils are soils where 25-90% is occupied by rock outcrops and most of the remainder by shallow soils. Light or coarse soils consist of sand, loamy sand, and sandy loam. Medium soil consists of loam, silt loam, silt, sandy clay and sandy clay loam. Heavy or fine soils consist of silty clay, silty clay loam, clay loam, and clay.
8. **APPLICATION TIPS:** For areas of heavy or fine textured soil, it is possible to plant into newly treated sites. A delay in planting is recommended until there is adequate moisture to activate the herbicide in the soil. Generally, once the symptoms of the herbicide are showing in plants, then it is safe to plant the above-noted crop trees. Do not plant into the above treated areas if conditions are not favourable for the crop trees to establish themselves immediately. Before application calibrate the equipment to distribute the granules uniformly over the area to be treated. When using equipment avoid overlapping and shut-off while starting, turning, slowing or stopping in order to avoid injury to desirable trees. Apply when rainfall can be expected to activate the chemical in the soil. **Do not apply** to hillsides or mountainsides where the slope is moderate to steep. **Do not apply** to sites whose physical state will prevent penetration of **Pronone 10G** into the root zone of the target species. This includes frozen soils, sites which are water saturated, or sites in which the water table is close to the surface.
9. **HOW IT WORKS:** Inhibits photosynthesis. "Moisture is required to activate Pronone 10G in the soil". Precipitation dissolves the active Hexazinone from the granule and moves the herbicide into the root zone where it is absorbed during periods of active plant growth.
10. **EXPECTED RESULTS:** Symptoms usually appear within 2 weeks after application under warm, humid conditions, while 4 to 6 weeks may be required when weather is cool. If rainfall after application is inadequate to activate Pronone 10G in the soil, plants may continue to grow until sufficient rainfall moves Pronone 10G into the root zone. In actively growing woody plants, symptoms usually appear within three weeks after sufficient rainfall has carried the herbicide into the root zone, during periods of active growth. Recurrent defoliation and refoliation may occur, until susceptible plants are killed. In some brush species, complete control may not be accomplished until the following year. The degree of control and duration of effect will vary with amount of chemical applied, rainfall, temperature, weed and brush species, soil moisture, soil type, depth of organic layer, season of application.

11. **EFFECT OF RAINFALL:** Rainfall after application will assist in moving Pronone 10G into active root zone of weed species.
12. **MOVEMENT IN SOIL:** Pronone will move down in the soil depending upon soil type and organic matter content.
13. **GRAZING AND CROPPING RESTRICTIONS:** For use in non-agricultural crop areas only. **Do not apply** or empty or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend or in locations where the chemical may be washed or moved into contact with their roots. **Do not use** on lawns, walks, driveways, tennis courts, or similar areas. Keep from contact with fertilizers, insecticides, fungicides and seeds. **Do not contaminate** any body of water.
14. **TOXICITY:** Low acute mammalian toxicity. **Eye irritant - Do not get in eyes.** Wear rubber gloves when handling. Avoid contact with skin and clothing. Harmful if swallowed.
15. **PRECAUTION FIRST AID:** In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. For eyes, call a physician. Get medical attention if irritation persists. Remove and wash contaminated clothing before reuse.
16. **STORAGE:** Store in a cool, dry place. Keep away from fertilizer, seed and food or feed.

PYRAMIN (pyrazon)

BASF

CAUTION POISON

1. **FORMULATIONS:** Flowable formulation 470 g/L; 3 L jugs.
2. **REGISTERED MIXES:** Avadex BW, TCA, or Ro-Neet.
3. **CROPS:** Sugarbeets.
4. **WEEDS CONTROLLED:**

Black nightshade	Pigweed (prostrate, redroot)
Buckwheat (wild)	Purslane
Chickweed	Ragweed
Knotweed	Shepherd's purse
Lady's thumb	Smartweed
Lamb's quarters	Stinkweed
Mustard (wild, wormseed)	Wild carrot
Oakleaved goosefoot	Yellow rocket

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Pyramin may be used as a pre-plant incorporated, pre-emergent or post-emergent treatment. Post-emergent treatments should be applied before the weeds have 3 leaves.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Rate: Light soils - 3.3 L/ac. Heavy soils - 4.1 L/ac.
   Water Volume: 40 - 101 L/acre.
   Incorporation: Pre-plant - incorporate shallow. Fall ridging - apply Pyramin in a 17.5 cm band and cover with a 15-20 cm high ridge of soil. In the spring, level the ridges and leave guide marks to enable planting the bands. Avoid levelling deeper than the chemical placement.
   Pressure: 275-350 kPa.
   Nozzles: All standard low pressure nozzles delivering 40-101 L/acre.
8. **APPLICATION TIPS:** Pyramin must not be mixed into soil deeper than seed is planted to reduce beet injury.
9. **HOW IT WORKS:** The active ingredient in Pyramin is absorbed by the roots and is translocated to the leaves.
10. **EXPECTED RESULTS:**
    Weed: If adequate moisture is present, the weeds will fail to emerge. If the soil is dry for a long period of time, weeds which emerge and become well established will not be fully controlled, but small emerged weeds may die back, once adequate moisture is present.
11. **EFFECTS OF RAINFALL:** No effect.
12. **MOVEMENT IN SOIL:** Pyramin does not move readily in the soil and cannot be leached out.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Drift: Care should be taken to avoid drift onto sensitive plants such as rapeseed and mustard.
    Grazing Restrictions: The tops of beets grown in Pyramin treated soil may be used for human consumption or fed to livestock.
    Cropping Restrictions: None.
14. **TOXICITY:** Very low acute mammalian toxicity. Oral LD_{50} rats = 3,030 mg/kg. No short term or long term human health problems are associated with this product when used according to label. Non-toxic to bees.

15. **PRECAUTIONS AND FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce the skin and eye contact. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a cool, dry place. Do not store below 0°C.

REFINE (thifensulfuron)

DuPont

CAUTION POISON

1. **FORMULATIONS:** Dry Flowable; 75%; 320 g container.
2. **REGISTERED MIXES:**
   MCPA: (400 mL/ac amine 500 + surfactant).
   Hoe-Grass: (1.0-1.1 L/ac of Hoe-Grass 284; do not use a surfactant with this tankmixture).
   Avenge 200C: (1.4-1.7 L/ac; do not use a surfactant with this tankmixture).
   Surfactants: Agsurf; Agral 90; Citowett Plus; (use a surfactant when Refine is used alone or in a mixture with MCPA).
3. **CROPS:** Barley (9.0), wheat [durum (9.0), winter (7.8), spring (8.8)], oats (8.6).
4. **WEEDS CONTROLLED:**

buckwheat, wild (8.2)	lady's-thumb	rapeseed, volunteer (8.5)
chickweed (7.7)	lamb's-quarters (8.4)	smartweed green (8.5)
cockle, cow (8.3)	mustard, wild (8.2)	stinkweed (7.7)
corn spurry	pigweed, redroot (8.0)	thistle, Russian (7.6)
hemp-nettle (7.6)		

5. **WEEDS SUPPRESSED:** Kochia; the addition of MCPA amine to Refine will give suppression of Canada thistle.
6. **WHEN USED:**
   Barley, wheat (durum, winter, spring), oats: 2 leaf to flag leaf stage.
   Weeds: Apply to young actively growing weeds before the canopy closes. Weeds emerging after treatment will not be controlled.
   Wild buckwheat: Apply Refine plus a recommended surfactant to actively growing wild buckwheat in the 1-3 leaf stage.
   Chickweed: Apply Refine when the chickweed is in the 1-6 leaf stage and actively growing.
7. **HOW TO APPLY:**
   With: Ground equipment. Do not apply by air. Chlorine bleach must be used to deactivate Refine when cleaning equipment.
   Sprayer Cleanup: To avoid injury to susceptible crops thoroughly clean sprayer immediately after spraying: Ammonia must be used to deactivate Refine when cleaning equipment.
   1. Drain and flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to assure removal of all visible residues of Refine. If necessary, repeat step 1.
   2. Fill tank with clean water, while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water to completely fill tank. Allow to sit for 15 minutes with agitation. Again flush the hoses, boom and nozzles with the cleaning solution and drain tank.
   3. Nozzles and screens should be removed and cleaned separately in a bucket containing cleaning agent and water.
   4. Repeat step 2.
   5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

   Caution: Do not use ammonia with chlorine bleach. Using ammonia with chlorine bleach will release a gas with a musty chlorine odour which may cause eye, throat and lung irritation. Do not clean equipment in an enclosed area. Do not clean sprayer near well or water source or near to desirable vegetation.
   Rate:
   Barley, wheat (durum, spring), oats: Refine 8 g/ac.
   Surfactant: 2 L/1000 of spray solution.
   Water Volume: 40 L/ac (minimum).
   Pressure: 275 kPa.
   Nozzles: Flat fan type. 50 mesh or larger screens. Only metal or nylon filters.
8. **APPLICATION TIPS:** Higher spray volumes are required for dense crop canopy and/or large weeds. Weeds should be less that 10 cm tall or across at application. Effectiveness of Refine may be reduced if it remains in the tank for more that 24 hours.
9. **HOW IT WORKS:** Absorbed by foliage. Inhibits cell elongation.
10. **EXPECTED RESULTS:**
    Weeds: Growth stops almost immediately. Discoloration of dying weeds may not be noticeable for 1-3 weeks after application depending on growing conditions and weed susceptibility. **Poor results may be expected if** improper mixing, timing, coverage, or when weeds are under drought stress.
11. **EFFECT OF RAINFALL:** Heavy rainfall immediately after application may cause temporary lightening of crop. Rainfall within 4 hours of application may lessen degree of weed control.

12. **MOVEMENT IN SOIL:** Refine moves little in the soil. It's life in the soil is very short.
13. **GRAZING AND CROPPING RESTRICTIONS:** Wheat, oats or barley may be grazed by or fed to livestock 7 days after treatment.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (greater than 5,000).
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a dry, cool place.
17. **RESISTANCE MANAGEMENT:** To delay selection for resistant weeds, rotate the use of Refine, Muster, Ally and Glean with other herbicides that are also effective on the same weeds. Also, where appropriate, use tank mixtures of Refine and other herbicides, except Ally, Glean and Muster, that are also effective on those weeds.

REGLONE (diquat)

ICI Chipman

CAUTION POISON

1. **FORMULATIONS:** Liquid; 200 g/L; 10 L container.
2. **REGISTERED MIXES:** None.
   Surfactant: Agral 90.
3. **CROPS:**

alfalfa	lentils	potatoes
beans (adzuki, kidney, red, white)	mustard	soybeans
canola	oats	sunflowers, all
clover (red, white)	peas (dry, field)	trefoil, bird's-foot
flax		

4. **WEEDS CONTROLLED:** Non-selective for green vegetation, used for weed control and crop desiccation for harvest.
5. **WEEDS SUPPRESSED:** Not applicable.
6. **WHEN USED:** For crop desiccation.
   Alfalfa, trefoil, clover (for seed): By air no more than 7 days prior to harvest.
   Beans, soybeans: By air or ground when 80-90% of natural leaf defoliation has occurred. Does not mature beans but removes green weeds.
   Canola: By air when 60-75% of the seeds have turned from green to brown.
   Flaxseed: By air when crop has reached 75% ball turn.
   Lentils: By air or ground when lowermost pods are yellow-brown and rattle.
   Mustard: By air when 75% of the seeds have turned.
   Peas: By air when the crop is mature. Will not mature peas but will kill green weeds present.
   Potato Vines: By air or ground 2 weeks before harvest.
   Sunflowers: By air at 20-50% moisture.
7. **HOW TO APPLY:**
   With: Aircraft or Ground equipment. Booms on ground equipment must be high enough to ensure proper coverage of foliage.
   Water Volume: Aircraft: 18 L/ac. Ground: 100-400 L/ac. Higher volumes for best results.
   Alfalfa, clover, trefoil, beans, soybeans, flax, mustard, peas, rapeseed, sunflowers: 90 - 180 L/ac.
   Oats: 90-135 L/ac.
   Pressure: 275-400 kPa.
   Nozzles: Aircraft flat fan type or hollow cone type (D8, D10 or D12 disc with 46 or 56 swirl plate). For ground application, flat fan.
   Rate: Add Agral 90 at 1 L/1,000 L spray mixture; **not** on oats.

Crop	Quantity/ac Ground	Aerial
Alfalfa, trefoil, clover (for seed)	0.8 - 1.3 L	None
Beans, soybeans (normal crop)	0.6 - 0.8 L	0.8 L
Beans, soybeans (dense crop)	0.8 - 1.1 L	1.1 L
Canola, flax, lentils, mustard, peas, sunflowers (normal crop, no weeds)	0.6 - 0.8 L	0.8 L
Canola, flax, lentils, mustard, peas, sunflowers (dense crop, weedy)	0.8 L	1.1 L
Oats: corn spurry control, up to 8 cm tall	445 mL	None
Oats: corn spurry control, over 8 cm tall	607 mL	None
Potatoes (light stands, little weed growth)	0.8- 1.1 L	0.8 - 1.1 L
Potatoes (heavy stands or weedy fields)	1.7 L	1.7 L

8. **APPLICATION TIPS:** Ground speed of 9 km/h. Muddy water will reduce effectiveness. Applications made on cloudy days or just prior to or during periods of darkness will increase effectiveness. Argentine varieties of rapeseed should only be desiccated to facilitate harvest of lodged crops. Losses can occur under unfavorable weather conditions. Polish varieties may be straight combined.
9. **HOW IT WORKS:** Reglone is a contact type herbicide, therefore, good spray coverage is essential. Absorbed by all leaf and stem surfaces, non-systemic. Interferes with photosynthesis.
   Warning: During adverse weather (heavy rain, hail or strong winds), the resultant damage to crops may be enhanced.
10. **EXPECTED RESULTS:**
    Weeds: Fast and virtually complete top kill of annual weeds. Yellowing starts within a few hours of application. Desiccation of the plant will continue rapidly till death.
    Crops: Leaf kill will occur within a few days of application. Stem fall will take longer depending on the crop, but harvesting should normally commence within 7-14 days.
11. **EFFECTS OF RAINFALL:** No effect once the spray solution has dried.
12. **MOVEMENT IN SOIL:** Binds to the soil and becomes biologically unavailable. No residual effect.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for livestock feed in year of treatment. Prevent drift onto crops, ornamental plants, lawns, shelterbelts, grazing areas, wildlife cover, wetlands and other desirable growth.
14. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (230). **Potential to cause eye damage, if eyes are constantly exposed.** May cause oral and nasal irritation shortly after use. Does not cause lung damage.
15. **PRECAUTIONS, FIRST AID:** May cause burns upon contact with skin and eyes. Wear standard protective clothing (see page xx) plus a respirator, goggles and rubber gloves. **If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention for eyes immediately. **If swallowed** seek medical attention. Intake can cause kidney failure and liver damage.
16. **STORAGE:** Heated storage is necessary. Store in original container, tightly closed in a safe place away from children.

RIVAL (trifluralin)

Hoechst
(Cereals)

1. **FORMULATIONS:** Emulsifiable Concentrate; Rival 500 EC; 500 g/L; 9 L jug. Granular; Rival 10G; 10.0%; 22.7 kg bag, 567 kg bags (mini bulk).
2. **REGISTERED MIXES:**
   Rival 10G: None.
   Rival 500 EC: Avadex BW, Avadex BW+liquid fertilizer, liquid fertilizer.
   Mix Restrictions: Add Rival 500 EC or Rival 500 EC + Avadex directly into the liquid fertilizer, mix thoroughly and apply immediately after mixing. Agitate until application is complete.
3. **CROPS:**
   Rival 500 EC: Barley, wheat (durum, spring).
   Rival 10G: Fall application: Barley. Fall and Summerfallow application: wheat (durum, spring and semi-dwarf) in soils with 2-8% organic matter.
   Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**
   Rival 500 EC: Green foxtail.
   Rival 10G: Barley, see Rival (Oilseeds). Wheat (fall): foxtail (green and yellow). Wheat (Summerfallow crop year): Foxtail (green and yellow), lamb's-quarters, suppression of Wild Oats and Wild Buckwheat.
5. **WEEDS SUPPRESSED:** See above.
6. **WHEN USED:**
   Rival 500 EC: Alone or with Avadex BW in the spring only after seeding and prior to emergence of crop.

Rival 10G: Barley: fall only, September 1 to soil freeze-up. Wheat: fall, September 1 to soil freeze-up for green foxtail only the following year. Wheat summerfallow: May 1-July 31.
Warning: Do not apply Rival 10G on land treated with trifluralin products since the previous year.

7. **HOW TO APPLY:**
With: Ground equipment.
Rate:
Rival 500 EC: 485 mL/ac on light to medium textured soil. 650 mL/ac on heavy textured soil.
Rival 10G: Barley: Light soils (2-4% Organic Matter-O.M.): 3.4 kg/ac; Medium or heavy soils (4-6% O.M.): 4.5 kg/ac. Medium or heavy soils (6-10% O.M.): 5.7 kg/ac. Wheat: Summerfallow application: May 4.5 kg/ac, June 3.9 kg/ac, July 3.2 kg/ac; Wheat: Fall application: 2.3 kg/ac.
Water Volume: 40 L/ac.
Pressure: 275 kPa.
Incorporation:
Rival 500 EC: Incorporate 2-4 cm with 2 cross harrowings with tyne or diamond harrows operated at a minimum of 9 km/h. Both incorporations should be done within 24 hours of application.
Rival 10G: Fall application: incorporate to 8-10 cm. The first incorporation within 24 hours and the second delayed for at least 5 days for more effective weed control. A shallow tillage in the spring, prior to seeding, is required. Wheat: summerfallow application: incorporate to 8 cm. The first incorporation within 24 hours and the second delayed to 5 days or until new weed regrowth requires a cultivation or discing. Additional shallow (8 cm) tillage operations may be required to control resistant weed growth.

8. **APPLICATION TIPS:**
Rival 500 EC: Apply only on fields that are trash free or summerfallow fields. Crops must be seeded 5-8 cm deep in a well tilled seedbed to prevent contact between the chemical and the seed.
Caution: Crop injury, delayed maturity or reduced yields, may occur if emerging crops are weakened from factors such as improper seeding depth, excessive moisture, cold temperature, seedling disease, poor soil fertility, drought, or saline soils.
Rival 10G:
Warning: Do not apply to soils with less than 2% O.M. or more than 10% O.M. Seeding should be done into a warm, moist seedbed. Avoid seeding in cold soil. In wheat, drought condition the fallow year may result in higher than normal carryover of Rival 10G; increase seeding rate of wheat. Populations of green foxtail tolerant to trifluralin products including **Rival** have developed in fields in Western Canada. **Rival** will not control trifluralin-tolerant green foxtail. Herbicide rotation should be practised to avoid the spread of trifluralin-tolerant green foxtail. Avoid repeated use of trifluralin products in the same field.
Caution: Do not apply to soils subject to erosion.

9. **HOW IT WORKS:** Acts on both the root and shoot tips as they emerge. Prevents cell division and affected plants die before emergence. If the shoot portion of the plant escapes to the soil surface, lateral or secondary root growth is inhibited causing a slow death since the plant is unable to gather moisture or nutrients.

10. **EXPECTED RESULTS:**
Rival 500 EC:
Green Foxtail: Seeds that germinate below the treated layer will produce plants that will emerge. The secondary root system of plants that form within the treated layer is completely inhibited by trifluralin present in that area. The affected plant dies slowly as crop competition and temperature stress over-tax the rootless plant's ability to take up moisture.
Crop: Crop safety is maintained when seeded to a depth of 5-8 cm.
Rival 10G: See Rival (Oilseeds).

11. **EFFECTS OF RAINFALL:** No effect once incorporated into the soil.

12. **MOVEMENT IN SOIL:** None.

13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for livestock feed in year of treatment.
Crop Use After Hail: No restrictions.
Succeeding Crops: See Rival (Oilseeds).

14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats mg/kg) = (greater than 5,000). In clean water, fish are very sensitive to trifluralin; but in runoff and muddy water, trifluralin binds to the suspended soil particles and large amounts can be tolerated by fish. Non-toxic to bees.

15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce skin and eye contact. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.

16. **STORAGE:**
Rival 500 EC: If stored below 0°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.
Rival 10G: Do not store under direct sunlight. Do not store in granular applicator (24 hours max.).

17. **RESISTANCE MANAGEMENT:** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, HERITAGE**, TRIFLUREX, FREE FLOW, RIVAL and FORTRESS) will not control trifluralin tolerant green foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use of these products repeatedly in the same field, or use a separate herbicide application for control of trifluralin tolerant green foxtail.
Note: Similar products are Treflan and Triflurex.

RIVAL (trifluralin)

Hoechst

(Oilseeds, Special Crops)

1. **FORMULATIONS:** Emulsifiable Liquid; Rival 500 EC; 500 g/L; 9 L jug. Granular; Rival 10G; 10.0%; 22.7 kg bag, 567 kg bags (mini bulk).

2. **REGISTERED MIXES:** Rival 10G: None. Rival 500 EC+liquid nitrogen fertilizer (28-0-0).
Mix Instructions: Rival 500 EC at recommended rates must be impregnated with a minimum of 81 kg/ac of dry fertilizer. Mix and blend the dry fertilizer and Rival 500 EC in a rotary fertilizer blender. The nozzles used to spray Rival 500 EC on the fertilizer should be situated to provide uniform spray coverage. Allow for sufficient blending time to ensure uniform coverage of the fertilizer with this product. If the fertilizer-herbicide mixture is too wet to allow for uniform application, the use of a highly absorptive material such as diatomaceous earth or finely powdered clay is recommended. Enough absorptive material should be added to ensure a free-flowing mixture.
Note: Higher rates of fertilizer may be required to ensure that mixture is not too wet especially when using higher rates of Rival 500 EC. Refer to the label for rate charts.

3. **CROPS:**

Rival 500 EC

asparagus
beans, dry common (only black, kidney, snap, white)
broccoli, transplant
brussel sprouts, transplant
cabbage
canola (8.9)
(including triazine tolerant)
carrots
cauliflower
crambe
fababeans (8.6)
flax (7.7)
forage rape
lentils* (8.5)
mustard (8.9)
peas (field, canning)
peppers
soybeans (8.9)
strawberries
sunflowers (8.9)
sweet clover
tomatoes
turnips (stubble)

Transplanted Shelterbelts

ash, green
caragana
elm (American, Siberian)
pine, Scotch

Rival 10G

canola (including triazine tolerant)
flax (7.7)
lentils* (8.5)
mustard (8.9)
peas (canning, field) (8.9)
sunflowers (8.9)

*Fall application only.
Underseeding: Not recommended.

4. **WEEDS CONTROLLED:**

barnyard grass (8.3)
bluegrass, annual (8.6)
bromegrass, downy (5.9)
buckwheat, wild (8.3)
chickwheat (7.1)
cockle, cow (9.0)
darnel, Persian
foxtail [green, yellow (8.1)]
knotweed
lamb's-quarters (8.0)
oats, wild (7.5)
pigweed (8.2)
purslane (7.9)
thistle, Russian (7.9)

5. **WEEDS SUPPRESSED:** None.

6. **WHEN USED:**
Rival 500 EC:
Spring: Beans, broccoli (transplant), brussel sprouts (transplant), cabbage, canola, carrots, cauliflower, crambe, fababeans, forage rape, mustard, peas, peppers, shelterbelts, soybeans, sunflowers, sweet clover, tomatoes, turnips (stubble). Cultivate to destroy existing weeds and apply pre-plant. Shelterbelts: apply before transplanting.
Summer: Canola, flax. On summerfallow between June 1 and September 1.
Fall: Beans (black only), canola, flax, lentils, mustard, peas (field), sunflowers. September 1st to soil freeze-up.
Rival application is discouraged where soil drifting is a problem.
Rival 10G:
Spring: Not recommended in Alberta.
Summer: Canola, flax. Between June 1 and September 1.
Fall: Canola, flax, lentils, mustard, peas, sunflowers. Between September 1 and soil freeze-up.
Note: For fall applications where erosion may be a problem, maximize crop residue cover with only one fall tillage incorporation.

7. **HOW TO APPLY:**
With: Ground equipment.
Water Volume: 40 L/ac.
Incorporation: First incorporation in the same direction as application, within 24 hours of application. Second at right angles to the first.
Rival 10G: For maximum effectiveness, delay the second incorporation for 5 days.
Flax, lentils: Both incorporations should be done prior to soil freeze-up in the fall. A tandem disc, discer or field (vibrashank) cultivator are recommended for incorporating to 8-10 cm. For best mixing action, operate disc implements at 6-10 km/h; cultivators at 10-13 km/h. Deep tillage cultivators are not recommended.
Pressure: 200-275 kPa.

Rate: Rival 500 EC will be applied at the same rates as currently listed for spring treatments, with the exception of cauliflower, cabbage and turnips (stubble) which are applied at 650 mL/ac in 2-6% OM and 1.38 L/ac in 6-15% OM.

	SANDY SOILS				LOAMS TO CLAY SOILS			
ORGANIC MATTER	**2-6%**		**6-15%**		**2-6%**		**6-15%**	
Crop/Season	**Rival 500 EC/ac**	**Rival 10G kg/ac**	**Rival 500 EC/ac**	**Rival 10G kg/ac**	**Rival 500 EC/ac**	**Rival 10G kg/ac**	**Rival 500 EC/ac**	**Rival 10G kg/ac**
Spring*	650 mL	NR	890 mL	NR	890 mL	NR	0.89-1.13L	NR
Fall*	890 mL	4.5	1.13 L	5.7	1.13 L	5.7	1.13-1.3L	5.7-6.9
Summer (flax, Canola)	1.38 L	6.9	1.38 L	6.9	1.38 L	6.91.38 L	6.9	
Shelterbelts	1.8 L	NR	3.6 L	NR	3.6 L	NR	3.6 L	NR
Strawberries	890 mL	NR	890 mL	NR	890 mL	NR	890 mL	NR
Asparagus	810 mL	NR	810 mL	NR	1.2 L	NR	1.6 L	NR
Flax, lentils (fall)	890 mL	4.5	1.13 L	5.7	890 mL	4.5	1.13-1.8L	5.7-6.9

*All crops except lentils and flax.
NR-Not Recommended.

Rival Plus Sencor Tankmix in Triazine Tolerant Canola (spring)

	SANDY SOILS		LOAMS TO CLAY SOILS			
ORGANIC MATTER	**2-3%**	**3-6%**	**2-3%**	**3-6%**	**6-10%**	**10-15%**
Rival 500 EC	650 mL/ac	650 mL/ac	890 mL/ac	890 mL/ac	0.89-1.13 L/ac	0.89-1.13 L/ac
Sencor 500F	170 mL/ac	220 mL/ac	170 mL/ac	220 mL/ac	220-340 mL/ac	340 mL/ac
Sencor 75 DF	110 g/ac	150 g/ac	110 g/ac	150 g/ac	150-220 g/ac	220 g/ac

8. **APPLICATION TIPS:** Do not apply on soils that are wet or subject to flooding, in poor tilth, or contain more than 15% organic matter. A tandem disc mixes best on stubble or crusted, lumpy, or wet soil. To avoid concentrating wild oat seeds below the treated layer, do not plow land prior to trifluralin application. Fall or summer application should be followed by a light spring tillage to a 5-8 cm depth before seeding.
   Rival 500 EC: Use on soils with less than 20-25% straw cover. On stubble, chop and thoroughly mix residues and weed growth into the soil, to a depth of 10-15 cm, before application.
   Flax, lentils: To ensure a firm seedbed and maintain a constant depth of planting, a shallow tillage in the spring is recommended. Seed into a warm (usually after mid May), moist, firm seedbed to a depth of 2-4 cm. Populations of green foxtail tolerant to trifluralin products including **Rival** have developed in fields in Western Canada. **Rival** will not control trifluralin-tolerant green foxtail. Herbicide rotation should be practised to avoid the spread of trifluralin-tolerant green foxtail. Avoid repeated use of trifluralin products in the same field.
9. **HOW IT WORKS:** Kills seedlings as they germinate. Inhibits cell division in the actively growing points of root and shoot.
10. **EXPECTED RESULTS:**
    Weeds: Most weeds die before emerging. Weeds will exhibit swelling in the coleoptile region, stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture obtaining ability.
    Crop: Seed flax into a well packed warm moist seedbed. Do not seed deeper than 4 cm.
11. **EFFECTS OF RAINFALL:** No effect once trifluralin is incorporated into the soil.
12. **MOVEMENT IN SOIL:** None.
13. **GRAZING AND CROPPING RESTRICTIONS:** None.
    Crop Use After Hail: No restrictions.
    Succeeding Crops: Normally, trifluralin carry over will not harm crops grown in rotation. As a precaution, oats, sugar beets, creeping red fescue, and small-seeded grasses such as timothy and canary seed should not follow a trifluralin treated crop. Alfalfa and most clovers are tolerant to trifluralin. Drought conditions in the year of treatment may result in higher levels of trifluralin carry over into the next year. To avoid wheat injury, seed less than 7 cm deep into a warm, moist seedbed.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (greater than 5,000). In clean water, fish are very sensitive to trifluralin, but in runoff or muddy water, it binds to soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Rival EC is highly flammable. May explode if heated. Wear standard protective clothing (see page xx) and goggles to reduce skin and eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake can cause heart, liver and kidney damage. A small amount of vomited liquid inhaled can be fatal.
16. **STORAGE:** Do not store below 0°C. If stored below 0°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.
    Note: Similar products are Treflan, Triflurex and Free Flow.

17. **RESISTANCE MANAGEMENT:** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, HERITAGE**, TRIFLUREX, FREE FLOW, RIVAL and FORTRESS) will not control trifluralin tolerant green foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use of these products repeatedly in the same field, or use a separate herbicide application for control of trifluralin tolerant green foxtail.

RO-NEET (cycloate)

ICI Chipman

CAUTION POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 720 g/L; 20 L containers.
2. **REGISTERED MIXES:** Nortron, Avadex BW, liquid and dry fertilizer.
3. **CROPS:** Sugarbeets, red beets and spinach.
4. **WEEDS CONTROLLED:**

Annual Grasses	Annual Broad-Leaf Weeds
Barnyard grass	Nightshade, hairy
Crab grass	Nightshade, black
Foxtail, green	Lamb's quarters
Foxtail, yellow	Redroot pigweed
Oats, wild	Purslane
	Henbit

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** May be applied in the fall, before the ground freezes or in the spring pre-plant soil incorporated. May be applied in mixture with Nortron during fall ridging.
7. **HOW TO APPLY:**
   With: Ground equipment, with liquid fertilizer, impregnated on dry fertilizer or equipment designed for application of granular herbicides. To prevent chemical loss, incorporate immediately into the soil (see incorporation, below).
   Rate: Sugar Beets - 2.5 to 3.1 L/ac on mineral soils only. Use lower rate on light sandy soils and the higher rate on heaviers soils.
   Water Volume: 80-160 L/acre.
   Incorporation: Incorporation must be thorough for good weed control and should be carried out immediately (within minutes) after application. Fall layering in conjunction with fall ridging may be carried out. Under most conditions, the treated area should be firmly rolled between the incorporation unit and the planter. Several types of implements can provide satisfactory incorporation - such as:
   For Broadcast (Overall) Applications:
   1. Hooded power-driven rotary tiller - teeth set close enough to uniformly mix to a depth of 5 to 7.5 cm.
   2. Tandem or offset discs at 10 to 15 cm depth. On heavy and medium soils, cross (disc twice at right angles). On light soil disc once followed by harrowing for additional mixing and to level the seed bed.

   For Band (Row Application): Uniformly mix to a depth of 5 to 7.5cm.
   1. Hooded power-driven rotary tiller.
   2. Hooded ground-driven rotary tiller.

   Pressure: 150 - 350 kPa.
   Ground Speed: 9 km/h.
   Nozzles: All standard and low presure nozzles. Do not use single nozzle boom-jet type sprayers.
8. **APPLICATION TIPS:** Use high volume low pressure nozzles, to insure maximum uniform coverage. Incorporate immediately after application.
9. **HOW IT WORKS:** Uptake by seed, roots and hypocotyl with upward trans-location to the growing tip of germinating weeds. It disrupts and stops further growth which kills the germinating weed. Species differentiation is due to enzymatic detoxification and seed food reserves permitting the seedling to outgrow the chemical effects.
10. **EXPECTED RESULTS:**
    Weeds: Ro-Neet is absorbed by the germinating weed seed, thus most affected weeds will not emerge. Numerous chlorotic shoots may be visible by removing the top few cm of treated soil. Weeds will be controlled before they can compete for moisture and nutrients essential to the crop. Control will be for most of the growing season.
    Crop: Under unfavourable germination conditions, leaf crinkling or leaf sealing may be observed, but usually without adverse effects on crop yield.
11. **EFFECTS OF RAINFALL:** Ro-Neet is water soluble, however, will not leach significantly under heavy rainfall.
12. **MOVEMENT IN SOIL:** Ro-Neet is quite resistant to leaching in heavy clay soils and in high organic soils. In loamy sand it may leach from the surface, downward several inches, with heavy precipitation.
13. **GRAZING AND CROPPING RESTRICTIONS:**
    Drift: Danger from drift is low.

14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (3,160). No short term or long term human health effects have been associated with this product. Very toxic to fish. Non-toxic to birds.
15. **PRECAUTIONS AND FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce the skin and eye contact. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Protect from temperatures below -6°C. Product crystallizes at lower temperatures. Do not use or store near heat or flame.

ROUNDUP/LAREDO/WRANGLER (glyphosate)

Monsanto/United Agri Products/Van Waters & Rogers

CAUTION CORROSIVE

1. **FORMULATIONS:** Water Soluble Liquid; 356 g/L; 1 L, 4 L or 10 L containers.
2. **REGISTERED MIXES:**
   Zero Till: Pardner+non-ionic surfactant.
   Chemical Fallow: 2,4-D amine (or Banvel or Pardner) + non-ionic surfactant.
   Non-Ionic Surfactants: Ag-Surf, Agral 90, Triton XR. Mixing with other pesticides: Not recommended.
3. **CROPS:** Fall stubble treatment, non-crop areas, minimum or zero till, pasture renovation, summerfallow.
4. **WEEDS CONTROLLED:**

Annuals		**Perennials**		**Brush**
barley, volunteer	mustard	bindweed, field (7.2)	milkweed, common	alder*
bluegrass, annual (9.0)	(volunteer, wild)	bluegrass (Canada,	quackgrass	birch*
brome, downy	oats, wild	Kentucky)(9.0)	sow-thistle, perennial	maple*
buckwheat, wild (6.7)	ragweed, common	bromegrass, smooth	thistle, Canada (7.8)	poplar*
corn, volunteer	shepherd's-purse	cattail	toadflax (8.5)	raspberry*
foxtail, green (7.9)	smartweeds, annual	cress, hoary	wormwood	snowberry*
knotweed	sow-thistle	dock, curled		willow*
kochia	stinkweed			
lady's-thumb	thistle, Russian			
lamb's-quarters	vetch, wild			
lettuce, prickly				

*Roundup only.

5. **WEEDS SUPPRESSED:** Flixweed, wild barley.
6. **WHEN USED:**
   Annual Weeds: Grassy and broad leaf weeds at least 15 cm tall and actively growing.
   Perennial Weeds:
   Canada Thistle (Bud Stage): At or beyond bud stage of growth.
   Canada Thistle (Fall Rosette): 15 cm in diameter and at least 5 weeks of growth. Majority of them in a rosette stage.
   Field Bindweed: At or beyond full bloom and actively growing.
   Milk Weed: Bud to full bloom stage of growth.
   Note: Reduce results may occur on plants treated after full bloom.
   Quackgrass (Spring, Summerfallow, Fall Stubble): At least 20 cm in height (3 to 4 leaf stage) of growth and actively growing.
   Quackgrass (Fall-Tilled Ground): Delay application in the spring until majority of quackgrass has 4-5 leaves. This stage usually occurs 1-4 weeks later on fall tilled ground than on undisturbed ground.
   Other Perennials: Mostly in head and early bud stage.
   Brush: Actively growing brush from June through August.
7. **HOW TO APPLY: Do not use galvanized steel or unlined steel tanks, as a combustible gas may be formed.**
   With: Ground equipment only - boom equipment, handgun, high volume equipment, wipers.
   Rate:
   Annual Weeds (less than 15 cm tall): 910 mL/ac; **(over 15 cm tall):** 1.4 L/ac.
   Bindweed (field): 2.8-4.9 L/ac.
   Canada thistle (bud): 1.9-2.8 L/ac; **(fall rosette):** 1.0 L/ac.
   Milkweed (common): 4.9 L/ac.
   Quackgrass (season long): 1.0 L/ac; **(long term):** 1.9-2.8 L/ac.
   Other perennials: 2.8-4.9 L/ac.
   Minimum or Zero Till: 445 mL+140 mL/ac non-ionic surfactant.
   Reduced Rates (Summerfallow): 300-400 mL/ac+140 mL/ac non-ionic surfactant. Brush: 1 L/100 L water.
   Water Volume: Handgun, high volume (coarse sprays only): 80-120 L/ac. Boom: 40-120 L/ac. Chemical fallow, reduced rates: 20-40 L/ac.
   Pressure: 275 kPa.
   Nozzles: Flat fan nozzles for volumes 20-40 L/ac: flood jet type or flat fan for volumes above 40 L/ac.

8. **APPLICATION TIPS:** Tillage or mowing prior to application will reduce effectiveness on perennial weeds. Minimum (days) to wait before tillage after Roundup applications: Annual weeds (3); Spring and fall quackgrass (5); Canada thistle Bud Stage (5), Fall Rosette Stage (7-10); Field bindweed, milkweed, other perennials (7).
   Quackgrass Control:
   Spring and Summer Fallow Treatments: Apply to actively growing quackgrass. Reduced control may result if rhizomes become dormant. This may occur when soil fertility is poor or when land has not been tilled for several years.
   Fall Treatments: Apply 3-4 weeks after swathing to actively growing quackgrass. Quackgrass can be treated after mild frost provided there are 3 to 4 green leaves and is actively growing at the time of application. Do not apply after first damaging frost in the fall. Frost of -5°C is usually tolerated by new shoots. Frost damage to growing shoots could reduce control and field should be left untilled for spring treatments. Frost damage is evident by the drying of new shoots shortly after frost.
   Canada Thistle (Fall Rosette): Conduct summer fallow tillage as suual and perform last tillage operation between July 15 and August 1. Allow thistles to regrow for a minimum of 5 weeks until they are 15 cm in diameter and majority of them in a rosette stage.
   Note: Canada thistle can be treated after a mild frost provided the leaves are still green and actively growing at the time of application. Do not treat after first killing frost.
9. **HOW IT WORKS:** A non-selective, systemic herbicide which moves from the foliage into the roots and kills the entire plant.
10. **EXPECTED RESULTS:** Wilting and yellowing of annuals occurs within 2-4 days, perennials require 7-10 days. Complete browning of above ground growth and deterioration of roots occurs. Cool or cloudy weather may slow activity.
11. **EFFECTS OF RAINFALL:** Rainfall within 6 hours may reduce effectiveness. Heavy rainfall within 2 hours after application may wash the chemical off foliage and require retreatment.
12. **MOVEMENT IN SOIL:** The amount of glyphosate leaching is very low.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for levestock feed in year of treatment.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (4,320). Eye irritant. Non-toxic to bees, birds, fish.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and goggles to reduce skin and eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Heated storage not required.

RUSTLER (NEW IMPROVED) (glyphosate + Dicamba)

Monsanto

DANGER CORROSIVE

1. **FORMULATIONS:** Water Soluble Liquid; 134 g/L glyphosate + 60 g/L Dicamba isopropylamine salt. 10 L, 115 L, 400 L containers.
2. **REGISTERED MIXES:** 2,4-D.
3. **CROPS:** Chemical fallow.
4. **WEEDS CONTROLLED:**

buckwheat, wild	foxtail, green	mustard, wild	rapeseed, volunteer
cereals, volunteer	kochia	oats, wild	smartweed
cow cockle	lady's-thumb	Persian darnel	stinkweed
flixweed	lamb's-quarters		

5. **WEEDS SUPPRESSED:** Foxtail barley.
6. **WHEN USED:**
   Annual grassy weeds: Anytime between emergence and heading, wild oats 1-3 leaf stage.
   Annual broadleaf weeds: Up to 15 cm tall, wild buckwheat 1-4 leaf stage.
   Foxtail barley: Before initiation of seed head or browning of lower leaves.
7. **HOW TO APPLY:**
   With: Ground equipment only. Avoid galvanized steel or unlined steel (except stainless steel) spray tanks.
   Water Volume: 20-40 L/ac **clean** water. Lower water volume may improve results, particularly with extremely hard water (greater than 700 ppm calcium+magnesium).
   Pressure: 275 kPa.
   Nozzles: Flat fan nozzles.
   Rate:

Weeds	Rustler L/ac
Annual grassy weeds	1.0
Annual broadleaves	1.0
Foxtail barley	1.3

8. **APPLICATION TIPS:** For best control, treat winter annual weeds (before 10 cm tall) with 2,4-D in the fall or early spring previous to the fallow season. To prevent injury to desirable crops clean the entire sprayer after using Rustler. First, add clean water to tank and thoroughly rinse the entire sprayer system. Secondly, fill the tank with water and ammonia (1 L household ammonia/100 L water). Pump enough solution through the system to fill all parts completely. Then fill tank, close and leave for 24 hours before draining and rinsing thoroughly with water.
9. **HOW IT WORKS:** A post-emergent herbicide. Moves from foliage into roots and kills entire plant.
10. **EXPECTED RESULTS:** Visual effects will usually appear within 5-7 days. Wilting or yellowing of weeds advances to complete browning of above ground growth and deterioration of affected underground parts.
11. **EFFECTS OF RAINFALL:** Heavy rainfall within 2 hours may wash the chemical off the foliage and repeat treatment may be required. Rainfall within 6 hours may reduce effectiveness.
12. **MOVEMENT IN SOIL:** The amount of leaching is very low.
13. **GRAZING AND CROPPING RESTRICTIONS:** Not applicable.
    Succeeding Crops: Do not seed a crop in a field treated with Rustler for at least 3 weeks after application.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = glyphosate (4,300); Dicamba (2600). Eye irritant. May cause allergic skin reaction. Non-toxic to bees and birds.
15. **PRECAUTIONS, FIRST AID:** Can be absorbed through the skin and causes burns to skin and eyes. Wear standard protective clothing (see page xx) and goggles to reduce skin and eye exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store above 5°C to keep product in solution. If crystals form, place in warm room (20°C). Roll or shake until crystals have redissolved.

SENCOR (metribuzin)

Chemagro

1. **FORMULATIONS:** Flowable; Sencor 500 F; 500 g/L; 4 X 5 L pack. Water Dispersible Granular; Sencor 75 DF; 750 g/kg; 4 X 3 kg pack. Water Dispersible Granular in water soluble packets; Sencor 75 (Solupak) 5 X 0.5 kg bags; 4 X 2.5 kg per case.
2. **REGISTERED MIXES:** Banvel or 2,4-D Amine 500 (barley, wheat); Eptam (potatoes); MCPA Amine 500 (barley, wheat); Target (barley, wheat); Treflan 545 EC (fababeans, field peas, triazine tolerant canola).
   Mix Instructions: Shake container thoroughly before adding to spray tank. Mix Sencor in the tank before adding Treflan. Continually agitate until all the mixture is sprayed. Do not allow the sprayer to stand without agitation.
   Mix Restrictions: Do not tank mix with any other pesticide, wetting agent, or surfactant.
3. **CROPS:**

alfalfa (established)	canola, triazine tolerant*	lentils (8.4)	potatoes (8.6)***
asparagus	fababeans (8.6)**	peas, [field (8.5),	wheat, spring (8.5)
barley (8.9)		processing (7.9)]	wheat, winter

   Underseeding: Do not underseed.
   ***Non-triazine tolerant canola will be killed.**
   Sencor+Treflan, **not Sencor alone.
   ***Not on Belleisle, Tobique, red skinned, or any early maturing varieties.
4. **WEEDS CONTROLLED:** (Sencor alone, post-emergent):

buckwheat, tartary (5.3)	groundsel, common	mustard [ball, wild (8.0), wormseed]	smartweeds, annual (8.5)
catchfly, night-flowering	hemp-nettle (8.4	pigweed, redroot (7.1)	spurry, corn (7.1)
chickweed (8.1)	henbit* (8.0)	rapeseed, volunteer (non-T.T.)(8.8)	stinkweed (8.2)
downy brome	lady's-thumb	shepherd's-purse	thistle, Russian* (7.2)
flixweed	lamb's-quarters (8.4)		

   *Apply Sencor at 225 mL/ac (150 g/ac) for control of these weeds.
   Sencor + Treflan preplant:

barnyard grass	cockle, cow	lady's-thumb	purslane
bluegrass, annual	foxtail (green, yellow)	lamb's-quarters	rapeseed, volunteer (non-T.T.)
bromegrass	darnel, Persian	mustard, wild	shepherd's-purse
buckwheat, wild	hemp-nettle	oats, wild	smartweed, green
chickweed	knotweed	pigweed, redroot	stinkweed
			thistle, Russian

5. **WEEDS SUPPRESSED:** Canada thistle (6.6), and sow-thistle with Banvel; MCPA; or 2,4-D mixes.
6. **WHEN USED:**
   Alfalfa (Only Irrigated): Sencor: In fall to dormant established stands. Injury may occur if Sencor is applied earlier than 18 months after seeding.
   Barley, wheat: Do not use if soil has less than 3% organic matter. Sencor: 2-5 leaf. Banvel Mix: barley, 2-3 leaf; wheat, 2-4 leaf. MCPA Amine Mix: 3-5 leaf. Target Mix: barley, 2-3 leaf; wheat, 2-5 leaf. 2,4-D Amine Mix: 3-5 leaf.

Winter Wheat (Norstar only): Apply in late fall after winter wheat has commenced tillering and initiated the development of secondary roots. Do not apply in irrigated wheat.
Canola (Triazine Tolerant): Do not use if soil has less than 2% organic matter. Sencor: before weeds are 5 cm tall. Treflan Mix: Pre-plant incorporated, fall or spring. Do not use if soil has less than 2% or more than 15% organic matter. Apply only once per season.
Fababeans: Treflan Mix: pre-plant incorporated. Do not use on muck soils.
Lentils, peas: Do not use if soil has less than 4% organic matter. Sencor: Before vines are 15 cm long and after weeds have emerged but less than 5 cm in height or diameter. Apply only once per crop season. In lentils a post-emergent split application or a single post-emergence application.
Peas, field: Treflan mix: pre-plant incorporated, fall. Do not use on soils with less than 4% organic matter.
Potatoes: Sencor: post-emergent; before weeds are 4 cm tall. Eptam Mix: pre-plant incorporated. Do not use on muck soils.
Note: Fall application of Sencor + Treflan is not recommended where soil drifting is a problem.

7. HOW TO APPLY:

Lentils, peas, triazine tolerant canola: Do not apply within 3 days after periods of cool, wet or cloudy weather as crop injury may occur. Plant lentils and peas at least 5 cm below the soil surface.
With: Ground equipment.
Water Volume: 40 L/ac. Lentils, peas, T.T. canola (post-emergent): 70 L/ac. Potatoes: 40-120 L/ac.
Incorporation:
Sencor+Eptam: On potatoes see Eptam.
Sencor+Treflan: On fababeans, triazine tolerant canola and field peas: Apply and incoporate in the same operation, if possible. Must be incorporated within 24 hours. Work twice in different directions. Use a tandem disc, discer or vibrashank type cultivator to cut 8-10 cm deep. Operate disc implements at 7-10 km/h; cultivators at 10-13 km/h.
Pressure: 200-275 kPa.
Nozzles: Tilt nozzles 45° forward for better spray penetration in post emergent applications.
Rate: Barley, wheat.

Herbicide(s)	Barley mL/ac(g/ac)+mL/ac	Klondike, Leduc, Johnston Barley mL/ac(g/ac)+mL/ac	Wheat (Spring) mL/ac(g/ac)+mL/ac
Sencor 500 F(75 DF) Alone	110-225(80-150)	110-170(80-110)	110-170(80-110)
Sencor 500 F(75 DF)+Banvel 480	110-170(80-110)+93	Not Recommended	110-170(80-110)+93
Sencor 500 F(75 DF)+MCPA Amine	110-225(80-150)+345-445	110(80)+345-445	110-170(80-110)+345-445
Sencor 500 F(75 DF)+Target	110-170(80-110)+405-605	Not Recommended	110-170(80-110)+405-605
Sencor 500 F(75 DF)+2,4-D Amine	110-225(80-150)+345-445	Not Recommended	110-170(80-110)+345-445

Crop	Sencor 500 F-mL/ac	Sencor 75 DF-g/ac	Tank Mixes
Alfalfa (only irrigated)	910	610	No mixes
Fababeans (Spring)(Pre-plant)	225-345	150-225	Treflan 545 EC 610-810 mL/ac
Potatoes (pre-plant)*	225-345	150-225	Eptam 8-E 1.70-2.2 L/ac
Canola (post-emergent)	170	110	See next page
Fababeans (Fall)(Pre-plant)	345	225	Treflan 545 EC 810-1050 mL/ac
Lentils (Post-emergent)	170	110	No mixes
Lentils (Post-emergent, split application)	85-110 plus 85-110	55-75 plus 55-75	No mixes
Peas, (Post-emergent)	170-225	110-150	See next page
Potatoes (post-emergent)*	225	150	Sencor alone
Winter wheat	345-500	225-300	Sencor alone

*Not on Belleisle, Tobique, red skinned, or any early maturing varieties.

Canola (triazine tolerant), Spring, pre-plant Application

Soil Type:	Sandy Soil		Loam-Clay Soils	
Organic Matter:	**2-3%**	**3-6%**	**6-10%**	**10-15%**
Sencor 500 DF	170 mL/ac	225 mL/ac	225-345 mL/ac	345 mL/ac
Sencor (75 DF)	(110 g/ac)	(150 g/ac)	(150-225 g/ac)	(225 g/ac)
+ Treflan 545 EL	+ 610 mL/ac	+ 610 mL/ac	+ 810-1050 mL/ac	+ 810-1050 mL/ac
Canola (triazine tolerant) Fall, pre-plant application				
Sencor 500 DF	225 mL/ac	285 mL/ac	285-345 mL/ac	345 mL/ac
Sencor (75 DF)	(150 g/ac)	(190 g/ac)	190-225 g/ac)	(225 g/ac)
+Treflan 545 EL	+ 810 mL/ac	+ 810 mL/ac)	+ 1050-1300 mL/ac	+ 1050-1300 mL/ac

Field Peas, Fall, pre-plant application

	4-6%	6-10%	10-15%
Sencor 500F	285 mL/ac	285-345 mL/ac	345 mL/ac
Sencor (75 DF)	(190 g/ac)	(190-255 g/ac)	(225 g/ac)
+Treflan 545 EC	+810 mL/ac	+1050-1300 mL/ac	+1050-1300 mL/ac

8. APPLICATION TIPS:

Allow 4-5 days between application of Sencor and post-emergent wild oat herbicides. Allow 4-5 days after frost for crop to recover before applying Sencor. Weed control may be reduced if Sencor is applied later than the 5 leaf stage of crop. Crop may be sprayed when wet with dew. Crop must be planted at least 5 cm below soil surface.

Sencor+Treflan: Cultivate to destroy existing weeds before application. On stubble fields, chop and thoroughly mix crop residues into soil to a depth of 10-15 cm. Disc type implements provide the best results. To avoid concentrating wild oat seeds below the treated layer, and causing soil erosion, do not plow (moldboard) land prior to application. On variable soils with light, sandy areas; some injury may occur on sandy areas if the rate used is for loams-clay soils. On soils with 10% organic matter and higher, broadleaf weed control may not be adequate. Do not apply to wet soils or soils subjected to periods of flooding. Do not incorporate with a field cultivator when the soil is crusted, lumpy, or too wet for good mixing action. Triazine tolerant canola is sensitive to deep seeding so seedbed should be shallowly tilled and packed just prior to seeding in the spring to ensure a firm seedbed and accurate depth of planting.

9. **HOW IT WORKS:** A systemic herbicide absorbed by leaves and roots and translocated to new growth. Inhibits photosynthesis and the weed turns brown and dies.
10. **EXPECTED RESULTS:**
    Broadleaf Weeds: Initial yellowing 5-7 days after application, weeds turn brown and die within 14-16 days. Active in soil for a short period and can control new shallow-rooted germinants, like chickweed.
    Crops: In extremely hot weather or frost that occurs within 1-2 days of application, crop will show some yellowing and slight reduction in height. Discolouration disappears in 7-10 days. On Klondike, Johnston and Leduc barley varieties, temporary lightening in colour and reduction in height may occur. Lentils and peas provide little competition against weed growth due to their low growth habit. Under heavy weed infestations or lush growth, control may be poor.
    Triazine tolerant canola:
    Field Peas: Stress such as disease, cold, deep planting, excessive moisture, high salts, or drought may weaken seedlings and increase the possibility of damage. Temporary lightening on the margins of cotyledons and a slight delay in development may occur. Ensure 70 L/ac water volume is used to reduce crop injury.
11. **EFFECTS OF RAINFALL:** Rainfall within 6 hours after application may reduce weed control.
12. **MOVEMENT IN SOIL:** Little leaching occurs in soils with high organic matter.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or feed treated crop to livestock within 30 days of application (lentils, peas: 70 days).
    Application to Harvest Interval (Days): Grain potatoes (60); lentils, peas (70); canola (75).
    Succeeding Crops: 24 months are required for crops other than potatoes if 910 mL/ac (610 g/ac) is applied on Alfalfa that is irrigated. Celery, cole crops, cucurbits, lettuce, onions, peppers, rapeseed, spinach, sugar beets, sunflowers, table beets, and turnips may be injured if planted in soil treated with Sencor during the year of application and the following crop year. Fall seeded or cover crops such as wheat, oats, and rye may be injured when seeded in the same season as the application of Sencor. For pre-plant applications of Sencor+Treflan; as a precaution oats, sugar beets, creeping red fexcue, and small-seeded grasses (e.g. timothy, canary seed) should not be planted the following crop year.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (1,100-2,300). Slightly toxic to fish and birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) when working with the product to avoid exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** No damage by freezing but avoid large temperature fluctuations. Store in a cool dry place.
    Note: A similar produc is Lexone.

SPIKE (tebuthiuron)

DowElanco

WARNING POISON

1. **FORMULATIONS:** Wettable Powder; Spike 80W; 80%; 2 kg, 10 kg bag. Granular; Spike 5G; 5%; 7 kg shaker box or 20 kg drum.
2. **REGISTERED MIXES:** None.
    Mixing Instructions: Maintain continuous agitation when using Spike 80W. If by-pass agitation is used, the return line should terminate at the bottom of the tank to minimize foaming. Any drift control products such as Nalcotrol should be added slowly after filling and thorough mixing of Spike 80W.
3. **CROPS:** Non-crop areas only.
4. **WEEDS CONTROLLED:** Total vegetation control.
5. **WEEDS SUPPRESSED:** Not applicable.
6. **WHEN USED:** Use throughout the growing season and up to September 15th. Best if applied early in spring before active plant growth. Do not use when ground is frozen or snow covered..
7. **HOW TO APPLY:**
    Spike 5G
    With: Shaker box or granular spreader.
    Rate: 44.5-91.0 kg/ac. Apply the higher rates for deep-rooted perennials and for greater residual effect.
    Water Volume: Do not dilute with water. Spike 5G is a ready-to-apply product.
    Spike 80WP
    With: Ground spray equipment.

Rate: 2.2-4.5 kg/ac. Higher rates for deep rooted perennial weeds, and for longer term weed control. For small amounts mix 125 g Spike 80WP per litre of spray solution.
Water Volume: 20-200 L/ac.

8. **APPLICATION TIPS:** Do not apply where bare ground is undesirable, where soil erosion may be a problem, or on areas where the roots of desirable vegetation may extend. Do not apply within a horizontal distance of 1.5 times the height of the stems of desirable trees. Do not use on walks, driveways, lawns, patios, tennis courts, or similar areas. Drift or any form of product movement from treated areas may cause damage to vegetation to which treatment is not intended. Clean application equipment thoroughly after use.
9. **HOW IT WORKS:** Requires rainfall to move into root zone. Absorbed by roots and inhibits photosynthesis.
10. **EXPECTED RESULTS:** Vegetation will turn brown and die. Speed of kill will depend on root depth and amount of rainfall. Duration of control will depend upon the amount of chemical applied, soil-type and environmental conditions. **Poor results may be expected from** inadequate application rate or application onto frozen ground.
11. **EFFECTS OF RAINFALL:** Rainfall will activate product, by carrying into the root zone.
12. **MOVEMENT IN SOIL:** Once moved into the soil by rainfall, will leach vertically with time. Heavy rain after application will move granules down a slope.
13. **GRAZING AND CROPPING RESTRICTIONS:** Spike is non-selective residual herbicide, only used on non-crop areas.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (644). Slightly toxic to fish and birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store in a dry place.

STAMPEDE CM (propanil + MCPA)

Rohm and Haas

WARNING POISON

WARNING CORROSIVE

1. **FORMULATIONS:** Emulsifiable Concentrate; 360 g/L propanil + 100 g/L low volatile MCPA ester; 11.4 L jug.
2. **REGISTERED MIXES:** None.
   Mixing Instructions: Add 1/2 the required amount of water, add Stampede CM, agitate and add remainder of water. Water used should be 10°C or warmer. Spray within 6 hours of mixing.
3. **CROPS:** Barley (8.6), canary seed (8.4), flax (8.4), oats (8.6), wheat [durum (8.6), spring (8.7)].
   Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**

bluebur (7.8)	kochia (6.7)	mustard, wild (7.5)	shepherd's-purse (9.0)
buckwheat [tartary (8.6), wild (7.1)]	lady's-thumb	pigweed, redroot (8.8)	smartweed (8.6)
flixweed (7.4)	lamb's-quarters (8.7)	rapeseed, volunteer (8.8)	stinkweed (8.7)
foxtail [green, (7.1), yellow]			

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Weeds: 1-4 leaf stage. Seedling or rosette stage for bluebur, kochia, flixweed, shepherd's-purse, stinkweed. Green foxtail: when the majority of plants are in the 3 leaf stage or less (less than 2.5 cm tall), effectiveness declines rapidly after the 5th leaf. Under dry conditions (soil moisture is deeper than 5 cm), apply when green foxtail is in the 2-3 leaf stage.
   Crops: Cereals: 2-5 leaf stage only. Flax between 5-12.5 cm tall.
   Temperature Effects: Do not spray crops when daily temperatures remain below 10°C or when they are expected to exceed 30°C. Under hot, dry and low relative humidity conditions spray during early morning or evening. Avoid spraying if crop is recovering from frost damage or if frost is expected within 24 hours.
7. **HOW TO APPLY:**
   With: Ground equipment only. Spra-coupe not recommended.
   Rate: 1.1 L/ac.
   Water Volume: Field sprayers: 45 L/ac. Floater type equipment: 65 L/ac.
   Pressure: 275 kPa.
   Ground Speed: 8 km/h field sprayers, 20 km/h or less for floaters.
   Nozzles: Only flat fan nozzles. Flooding nozzles can be used on floaters.
8. **APPLICATION TIPS:** Do not apply Stampede CM to crops grown in fields in which Atrazine or other triazine herbicides (such as Lexone, Sencor, Bladex, Blagal, Marksman, Simadex, Princep, Laddok) have been applied until soil analysis confirms that the residues have completely disappeared. A 3 day interval is required before or after an application of Stampede CM and another herbicide.

Insecticide Intervals: Severe injury of crops may result from a tank mix or separate applications of Stampede CM and certain insecticides in the same crop year, e.g. Sevin (carbaryl), parathion methyl, or Guthion. Decis may be applied any time before or after Stampede CM or tank mixed with Stampede CM. After applying Stampede CM, wait a minimum of 5 days for wheat and 10 days for barley before applying Furadan. After applying Stampede CM, wait a minimum of 14 days before applying dimethoate (Cygon) or Malathion. No other insecticides are registered for foliar use in the same year as Stampede CM. Do not spray with Stampede CM if the field was treated with soil-applied systemic organophosphorous insecticides in the same or previous crop year.

9. **HOW IT WORKS:** Rapidly absorbed by foliage to cause breakdown of cell walls and cellular metabolism. The MCPA component causes phenoxy-specific symptoms. Activity is essentially contact, and thorough spray coverage is necessary for optimum weed control. Weeds become tolerant beyond the 4 leaf stage as well as under stress conditions.
10. **EXPECTED RESULTS:**
Weeds: Within 3-5 days, weeds turn brown and have a "burnt-off" or dried out appearance. Weeds past the recommended stage will show extensive desiccation, but some green tissue remains and new growth may be generated enough to recover. Weeds emerging after spraying are unaffected.
Crops: Temporary yellowing, and leaf tip burn will usually be more noticeable in barley, oats, and flax than wheat. These effects disappear 10-14 days after treatment. New growth develops normally and yields are not reduced. Applied under extreme stress conditions, Stampede CM may cause a slight delay in crop maturity, and some suppression of growth in flax. This may be offset by increased yield due to weed control.
11. **EFFECTS OF RAINFALL:** Light rain 1 hour after application of Stampede CM does not reduce weed control. A heavy rain of 25 mm or more within 4 hours of application may reduce control.
12. **MOVEMENT IN SOIL:** Propanil is relatively non-mobile. MCPA is readily leached from soil. Longer residual in dry soil.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for green feed until 30 days after treatment.
Drift: Danger is low; however, avoid spray drift to susceptible crops such as rapeseed, sunflowers, vegetables or ornamentals.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (1,950). Propanil has potential to cause chlorachne - a skin disease in man following prolonged exposure.
15. **PRECAUTIONS, FIRST AID:** Can be absorbed through the skin and cause burns to skin and eyes. Wear standard protective clothing (see page xx) to reduce skin exposure since propanil can cause skin problems.
Symptoms of poisoning: Giddiness, intoxication, and headache. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Heated storage is not required. If frozen, warm and agitate thoroughly to redissolve crystals

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STAMPEDE 360 (propanil)

Rohm and Haas

WARNING POISON

WARNING CORROSIVE

1. **FORMULATIONS:** Emulsifiable Concentrate; 360 g/L; 11.4 L jug.
2. **REGISTERED MIXES:** Stampede 360 should **not** be used alone. Glean [barley (only Argyle, Bedford, Klages), wheat (Durum, spring)]. MCPA Ester [barley, canary seed, flax, oats, wheat (durum, spring)]. 2,4-D LV Amine or Ester [wheat (durum, spring)]. Decis (see label for rates).
Mixing Instructions: Add 1/2 required amount of water. Add MCPA; 2,4-D; Glean; or Decis. Add Stampede 360, then any required surfactant. Agitate and complete filling. Agitate at least 5 minutes immediately before spraying. Water should be 10°C or warmer. Spray the solution within 6 hours of mixing.
3. **CROPS:** Barley (8.4), flax (8.4), oats (8.9), wheat [durum (8.7), spring (8.8)].
4. **WEEDS CONTROLLED:**

Stampede 360 + Glean: Barley (only Argyle, Bedford, Klages), wheat (durum, spring).

buckwheat	foxtail [green (6.0), yellow]	mustard, wild (8.0)	shepherd's purse
[tartary, wild (7.9)]	hemp-nettle (8.3)	pigweed, redroot	smartweeds, annual
cockle, cow (9.0)	lady's-thumb	rapeseed, volunteer (8.1)	stinkweed
flixweed	lamb's-quarters		

Stampede 360 + MCPA Ester: Barley, canary seed, flax, oats, wheat.

bluebur (7.8)	foxtail [green (7.1), yellow]	mustard, wild (7.5)	shepherd's-purse (9.0)
buckwheat	kochia (6.7)	pigweed, redroot (8.8)	smartweeds, annual (8.6)
[tartary (8.6), wild (7.1)]	lady's-thumb	rapeseed, volunteer (8.8)	stinkweed (8.7)
flixweed (7.4)	lamb's-quarters (8.7)		

Stampede 360 + 2,4-D (Amine or Ester): Wheat.

bluebur	flixweed	lamb's-quarters	rapeseed, volunteer
buckwheat	foxtail (green, yellow)	lettuce, prickly	shepherd's-purse
(tartary, wild)	goat's-beard	mustard, wild (7.3)	smartweeds, annual
burdock	hawk's-beard, narrow-leaved	pigweed (redroot, Russian)	stinkweed
clover, sweet	kochia	plantain	sunflower, annual
cocklebur	lady's-thumb	radish, wild	thistle, Russian (7.5)

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Weeds: 1-4 leaf stage. Seedling or rosette stage for bluebur, kochia, flixweed, hawk's-beard, shepherd's-purse, stinkweed. Green foxtail: when the majority of plants are in the 3 leaf stage (less than 2.5 cm tall), effectiveness declines rapidly after the 5th leaf. Under dry conditions (soil moisture deeper than 5 cm) apply when green foxtail is in the 2-3 leaf stage.
   Crops: Glean Mix: Cereals 2-4 leaf stage. MCPA Mix: Cereals 2-5 leaf stage only; Flax between 5-12.5 cm tall. 2,4-D Mix: Wheat 3-5 leaf stage only.
   Temperature Effects: Do not spray crops when daily temperatures remain below 10°C or when they are expected to exceed 30°C. Under hot, dry and low relative humidity conditions spray during early morning or evening. Avoid spraying if crop is recovering from frost damage or if frost is expected within 24 hours.
7. **HOW TO APPLY:**
   With: Ground equipment only. Spra-coupe not recommended.
   Rate:
   Stampede 360: 1.1 L/ac (cereals, flax, canary seed).
   Glean: 6 g/ac [barley (only Argyle, Bedford, Klages), wheat (durum, spring)].
   MCPA Ester 500: 220 mL/ac (cereals, flax).
   2,4-D Amine 500: 485 mL/ac [wheat (durum, spring)].

2,4-D Esters:	**500**	**600**	**700**
wheat (durum)	325 mL/ac	270 mL/ac	230 mL/ac
wheat (spring)	325-485 mL/ac	270-400 mL/ac	230-345 mL/ac

   Water Volume: Field sprayers: 45 L/ac. Floater type equipment: 65 L/ac.
   Pressure: 275 kPa.
   Ground Speed: 8 km/h for field sprayers, 20 km/h or less for floaters.
   Nozzles: Only flat fan nozzles. Flooding nozzles can be used on floaters.
8. **APPLICATION TIPS:** Drain and flush sprayer tank and lines after spraying is completed. Do not apply Stampede 360 to crops grown in fields in which Atrazine or other triazine herbicides (such as Lexone, Sencor, Bladex, Blagal, Marksman, Simadex, Princep, Laddok) have been applied until soil analysis confirms that the residues have completely disappeared. A 3 day interval is required before or after an application of Stampede 360 and another herbicide.
   Insecticide Intervals: Severe injury of crops may result from a tank mix or separate applications of Stampede 360 and certain insecticides in the same crop year e.g. Sevin (carbaryl), parathion methyl, or Guthion. Decis may be applied any time before or after Stampede 360 or tank mixed with Stampede 360. After applying Stampede 360, wait a minimum of 5 days for wheat and 10 days for barley before applying Furadan. After applying Stampede 360, wait a minimum of 14 days before applying dimethoate (Cygon) or Malathion. No other insecticides are registered for foliar use in the same year as Stampede 360. Do not spray with Stampede 360 if the field was treated with soil-applied systemic organophosphorous insecticides in the same or previous crop year.
9. **HOW IT WORKS:** Absorbed by leaves and causes cell wall breakdown and interference with the cellular metabolism. Activity is primarily contact, therefore, thorough spray coverage is necessary for optimum weed control. Susceptible weeds become tolerant beyond the 4 leaf stage. Stress conditions will trigger a hardening off process and hasten the development of tolerance to chemical control.
10. **EXPECTED RESULTS:**
    Weeds: Affected weeds turn brown in 3-5 days and have a "burnt-off", or desiccated, appearance. Weeds past the recommended stage will show extensive browning, but some degree of green, tissue remains. New tissue is produced, and the weed will recover. Weeds emerging after spraying are unaffected.
    Crops: Temporary yellowing and leaf tip burn occur and is more pronounced in oats, flax, and barley than in wheat. Effects will disappear 10-14 days after treatment. New growth is not affected and yields are not reduced. Under stress conditions, a slight delay in crop maturity may be noticed.
11. **EFFECTS OF RAINFALL:** Light rainfall 1 hour after application does not reduce weed control. A heavy rain of 25 mm or more within 4 hours of application may reduce control.
12. **MOVEMENT IN SOIL:** Propanil is relatively non-mobile.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for green feed until 30 days after treatment.
    Drift: Danger is low; however, avoid spray drift to susceptible crops such as rapeseed, sunflowers, vegetables or ornamentals.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (560), Stampede 360 (3130). Propanil has potential to cause chlorachne - a skin disease in man following long-term exposure.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) to reduce skin exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii).
    Symptoms of poisoning: Giddiness, intoxication and headache. **If swallowed** seek medical attention.
16. **STORAGE:** Heated storage not required. If frozen, warm and agitate thoroughly to redissolve crystals.

SUTAN$^+$ (butylate)

ICI Chipman

1. **FORMULATIONS:** Emulsifiable Concentrate; 800 g/L; 10 L container.
2. **REGISTERED MIXES:** Atrazine, Bladex, dry and liquid fertilizers (urea and urea blends only).
   Mix Restrictions: Check compatibility with fertilizers before tank mixing.
3. **CROPS:** Corn (field, silage, sweet).
4. **WEEDS CONTROLLED:**

Sutan$^+$	Sutan$^+$+Atrazine	Sutan$^+$+Bladex
barnyard grass	buckwheat, wild	buckwheat, wild
foxtail (green, yellow)	lady's-thumb	lady's-thumb
panicum, fall	lamb's-quarters	lamb's-quarters
	mustards	mustards
	oats, wild	nightshade, black
	pigweed, redroot	purslane
	purslane	ragweed
	ragweed	shepherd's-purse
	smartweed	

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Pre-plant soil incorporated.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Rate: 1.7-2.2 L/ac. Sandy soils 1.7 L/ac. Clay soils 2.2 L/ac.
   Atrazine Mix: 1.7-2.2 L/ac Sutan$^+$+(Aatrex Nine-O, Atrazine 90W-506-810 g/acre **or** Atrazine 500 810 mL/acre **or** Aatrex Liquid 0.91-1.5 L/acre).
   Bladex 80 W or Liquid Mix: 1.7-2.2 L/ac Sutan$^+$+(0.9-1.1 kg/ac Bladex 80 W **or** 1.5-1.9 L/ac Bladex Liquid.).
   Water Volume: 40 L/ac minimum.
   Incorporation: Within minutes of application. Use power driven cultivation equipment, set to cut 5-7.5 cm deep or disc set 10-15 cm. Both types of equipment should operate at 6.9-9.5 km/h. Light duty cultivators with tines on 15-20 cm centres, set 10 cm deep and operate at 9.5-13 km/h. For discs and field cultivators, a second working at right angles to the first will ensure thorough mixing.
   Pressure: 275 kPa.
8. **APPLICATION TIPS:** Proper rates, immediate double incorporation (within 1 hour) is very important.
9. **HOW IT WORKS:** Absorbed by roots and shoots of a germinating weed, disrupts and stops growth causing eventual death of germinating weed.
10. **EXPECTED RESULTS:**
    Weeds: Affected weeds do not emerge, distorted and chlorotic shoots are visible by removing the top layer of treated soil.
    Crops: Sutan$^+$ is safe on crop. Other chemicals, insects, or weather may weaken seedlings resulting in crop injury. **Poor results may be expected if** soils are wet, cloddy and trashy, these soil conditions are not suitable for proper application and incorporation.
11. **EFFECTS OF RAINFALL:** Soluble in water therefore, excessive moisture may cause some leaching (usually not a problem in Alberta).
12. **MOVEMENT IN SOIL:** Will not move readily.
13. **GRAZING AND CROPPING RESTRICTIONS:** No restrictions on grazing, crop use after hail, or succeeding crops. Danger from drift is low.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (3,500-5,431).
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Heated storage not required.

SWEEP (paraquat)

ICI Chipman

1. **FORMULATIONS:** Liquid; 250 g/L; 10 L container.
2. **REGISTERED MIXES:** Banvel+2,4-D; bromoxynil+MCPA; Lorox L+MCPA; 2,4-D; MCPA.
   Mix Restrictions: Use very clean water as muddy water will inactivate chemical. Use amine formulations immediately.
3. **CROPS:** Chemical fallow on summerfallow.
   Underseeding: Not applicable.
4. **WEEDS CONTROLLED:** Annual grasses and annual broadleaf weeds when tank-mixed with broadleaf herbicide.
5. **WEEDS SUPPRESSED:** Most perennial weeds.
6. **WHEN USED:** At the 2-4 leaf stage of annual weeds. Usually 2 applications are required for annual grass control, 1 in late May or early June and another in late July or early August.
7. **HOW TO APPLY:**
   With: Ground equipment. Do not use mist blowers.
   Rate: 700 mL/ac. Under adverse growing conditions of drought or heavy weed infestations 910 mL/ac for annual grass control.
   Water Volume: 50-80 L/ac weeds in 2-4 leaf. 60-80 L/ac weeds in advanced stage. Higher volumes when foliage is dense.
   Pressure: 300 kPa.
8. **APPLICATION TIPS:**
   Thorough coverage of weeds is essential.
   Apply Sweep+Lorox L+MCPA only once per season.
   Applications made on cloudy days, or periods of darkness will generally increase the effectiveness.
   Thoroughly wash equipment after spraying using Agral 90 at 60 mL/100 L of water.
9. **HOW IT WORKS:** A contact herbicide absorbed by leaves and stems. Interferes with photosynthesis and causes yellowing and eventual death.
10. **EXPECTED RESULTS:**
    Weeds: Provides immediate, fast and virtually complete annual grass control. Repeat applications will be necessary when new weeds emerge. Yellowing occurs in a few hours, followed by rapid desiccation and later death. When tank-mixed with a broadleaf herbicide, most annual weeds will be controlled.
    Crop: Not applicable.
11. **EFFECTS OF RAINFALL:** No effect once the spray solution has dried on the plant.
12. **MOVEMENT IN SOIL:** Binds to the soil and becomes biologically unavailable. No residual effect.
13. **GRAZING AND CROPPING RESTRICTIONS:** None. Avoid drift onto crops, grazing areas, and other desirable growth.
14. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = paraquat ion (120-150). **May be fatal if swallowed.**
15. **PRECAUTIONS; FIRST AID:** Can be absorbed through the skin. Wear standard protective clothing (see page xx). Wear rubber gloves, safety goggles, and a face shield when handling the concentrate. **Keep out of reach of children and animals. If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake can cause heart, liver and kidney damage and can be fatal.
16. **STORAGE:** Never transfer to other containers. Store tightly in original containers and in a safe place. Heated storage.

TARGET (MCPA + mecoprop + dicamba)

Ciba-Geigy

1. **FORMULATIONS:** Liquid; 275 g/L MCPA + 62.5 g/L mecoprop + 62.5 g/L dicamba; 2 X 10 L pack, 400 L pack.
2. **REGISTERED MIXES:** Afolan F, Lorox L, Sodium TCA (barley) or Sencor (barley, wheat).
3. **CROPS:** Annual canary seed (9.0), barley (8.5), oats (9.0), summerfallow (thistle control), wheat [durum (8.8), hard red spring (8.4), winter (8.6)].
4. **WEEDS CONTROLLED:**

buckwheat [tartary (8.5), volunteer. wild (8.5)]	flixweed (8.5)	mustards [ball, volunteer, wild (8.8), wormseed]	smartweeds, annual (8.0)
catchfly, night flowering (7.5)	hemp-nettle	pigweed (prostrate, redroot) (8.5)	sow-thistle, annual
chickweed*	knotweed	ragweed, common	spurry, corn (8.8)
cleavers (7.5)	kochia (8.0)	rapeseed, volunteer (9.0)	stinkweed (8.8)
cockle, cow (8.5)	lady's-thumb	shepherd's-purse	sunflowers, volunteer (8.3)
	lamb'-quarters (8.7)		thistle, Russian (8.5)

*Only in tank mix with Afolan F, Lorox L and Sencor.

*Only in tank mix with Afolan F, Lorox L and Sencor.

5. **WEEDS SUPPRESSED:** Canada thistle (6.6), bindweed (field and hedge), sow thistle (perennial).
6. **WHEN USED:** Annual canary seed, wheat (durum, spring), oats: 2-5 leaf stage. Barley: 2-4 leaf stage. Winter wheat: apply in spring before crop is more than 30 cm tall. Weed growth stage: 2-5 leaf stage. Cleavers (1-2 whorl), hemp-nettle (before second pair of true leaves), Russian thistle (less than 5 cm). Summerfallow: Canada thistle is in the early bud stage. Post harvest (stubble): Canada thistle actively growing 15-20 cm, do not apply within 2 weeks of a killing frost.
7. **HOW TO APPLY:**
   With: Ground Equipment.
   Rate: 405-610 mL/ac. For cleavers, Canada thistle, field bindweed, hedge bindweed, hemp-nettle, sow-thistle (perennial), volunteer canola: 610 mL/ac. Summerfallow: 810 mL/ac. Post Harvest (stubble): 810 mL/ac.
   Water Volume: 40 L/ac.
   Pressure: 200-300 kPa.
8. **APPLICATION TIPS:** Use the higher rate when weeds are beyond the 3 leaf stage, when weed densities are high, under adverse weather conditions, or control of overwintering fixweed, shepherd's purse, and stinkweed. In winter wheat, spray winter annuals as soon as growth begins in spring. Do not let contents stand for long periods of time. Agitate every 8 hours.
9. **HOW IT WORKS:** A combination of 3 systemic hormonal herbicides which accummulate in the growing point of susceptible plants, produce abnormal growth and disrupt the transport system in plants.
10. **EXPECTED RESULTS:**
    Weeds: Can take up to 7-14 days depending on weather and growing conditions. Leaves curl, leaf edges turn brown, petioles twist, plant ceases growth and turns brown and dies.
    Crop: Improper or untimely application can result in abnormal bending at the nodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels and sterile florets. Under certain conditions straw shortening may occur but yield will not be affected. **Poor results may be expected if** there is poor coverage, rainfall less than 3 hours after application or weeds too advanced. Dicamba containing products can be hard on crops if incorrectly applied.
11. **EFFECTS OF RAINFALL:** Rainfall within 3 hours will reduce activity.
12. **MOVEMENT IN SOIL:**
    MCPA/mecoprop: Readily mobile in the soil.
    Dicamba: Relatively mobile; mobility affected by capillary movement and/or surface evaporation. Concentration and location in the soil profile will be determined by total seasonal precipitation, its frequency, and original herbicide dosage.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze or harvest for livestock feed within 7 days of application. Most vegetables and fruit crops are very sensitive to drift. Cereal and broadleaf crops can be grown the year following application.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = MCPA (100-500), mecoprop (930), dicamba (2,629), Target (1,600). Non-toxic to fish. Toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Can be absorbed through the skin and causes burns to skin and eyes. Wear standard protective clothing (see page xx) to avoid exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
16. **STORAGE:** Heated storage only. Bulk containers are re-useable. **Do not rinse with water.** Return to your Ciba-Geigy retailer for recycling.

TORDON 22K (picloram)

TORDON 101 MIXTURE (picloram + 2,4-D)(Industrial)

DowElanco

Available only to authorized pesticide applicators.

CAUTION POISON

1. **FORMULATIONS:** Solution: Tordon 22K; 240 g/L; 2 L bottle, 10 L jug: Tordon 101 Mixture; 65 g + 240 g/L; 10 L, 20 L jugs, 205 L drums.
2. **REGISTERED MIXES:** None.
3. **CROPS:**
   Tordon 22K: Permanent grass pastures, rangeland, spot treatment on cultivated cropland, utility rights-of-way.
   Tordon 101 Mixture: Non-crop areas (utility rights-of-way).
4. **WEEDS CONTROLLED:**
   Tordon 22K:
   Group 1: Scentless chamomile.
   Group 2: Knapweed (diffuse, spotted).
   Group 3: Canada thistle, pasture sage, poverty weed, Russian knapweed, sow-thistle.
   Group 4: Field bindweed, leafy spurge, toadflax.
   Tordon 101 Mixture:
   Brush: Alder, birch, cedar, maple, pine, poplar, spruce, and other species.

Weeds: Burdock, Canada thistle, clover (red, sweet), common ragweed, dandelion, dock, goldenrod, fleabane, plantain, prickly lettuce, vetch, wild carrot.

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
   Tordon 22K: Anytime when fully developed green leaves are present.
   Tordon 101 Mixture:
   Brush: After foliage is well developed. Unsatisfactory results may occur if applications are made when foliage has lost its normal green colour.
   Weeds: Spring or early summer after growth appears.
7. **HOW TO APPLY:**
   With:
   Tordon 22K: Boom, handgun or backpack.
   Tordon 101 Mixture: Ground equipment or helicopter using drift control system or agent.
   Rate:

Tordon 22K:	**Tordon 22K per 100m^2:**
Group 1: 445 mL/ac.	**Group 1:** 11 mL.
Group 2: 910 mL/ac.	**Group 2:** 22 mL.
Group 3: 1.8 L/ac.	**Group 3:** 45 mL.
Group 4: 3.6 L/ac.	**Group 4:** 90 mL.

   Tordon 101 Mixture:
   Brush: 7.3-10 L/ac (ground); 10-14 L/ac (air).
   Weeds: 2.8 L/ac.
   Water Volume:
   Tordon 22K: 160-324 L/ac.
   Tordon 101 Mixture: 80 L/ac.
8. **APPLICATION TIPS:** Tordon 22K used as a spot treatment in a crop. No spot treatment should exceed 1 acre, and the total area treated in any 1 field in a year should not exceed 5% of the field.
   Note: Picloram is extremely persistent and water soluble. Small quantities may cause damage to desirable plants. Do not apply, or permit any Tordon to contaminate soil used to grow desirable susceptible plants. Do not contaminate water used for irrigation or domestic purposes.
9. **HOW IT WORKS:** Interferes with cell division, causing leaf cupping, stem distortion and eventual death of plant. Tordon 101 and 22K are absorbed through leaves and roots.
10. **EXPECTED RESULTS:**
    Tordon 22K: Perennial weeds show distorted stems and cupped leaves, which turn yellow and then brown. Usually native grass increases in abundance as a result of reduced competition.
    Tordon 101 Mixture: 2-3 weeks after the first rainfall after treatment, leaves of affected trees become dull and cupped; orange streaks appear on stems of poplar trees, leaves become brown and brittle, as the tree dies. **Poor results may be expected if** there is heavy rainfall immediately after treatment on light sandy soil.
11. **EFFECTS OF RAINFALL:** Heavy rainfall may dissolve and carry picloram away from the target area, or percolate dissolved picloram out of the root zone of target plants.
12. **MOVEMENT IN SOIL:** Picloram is very soluble in water and moves with water in coarse textured soils.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not graze treated area by dairy animals within 6 weeks after treatment. Manure from picloram treated vegetation should not be used to grow sensitive crops but rather be returned to a cereal crop field. When applied as a spot treatment on cropland, picloram may persist in soil for up to 5 years, and prevent the establishment of sensitive crops.
    Succeeding Crops:
    1st Year: Oats.
    2nd Year: Oats or barley.
    3rd Year: Oats, barley, or wheat. A reduction in yield in the 1st year, is usually offset by benefits of weed control obtained. Legumes may not be established in a pasture for several years after a Tordon treatment. If legumes are essential in a pasture, do not use Tordon.
14. **TOXICITY:** Low (22K) or moderate (101 Mixture) acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical Picloram (8,200); Tordon 22K (10,330); Tordon 101 Mixture (3,080).
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake can cause kidney and liver damage.
16. **STORAGE:** Tordon 22K: Store in a cool, dry place. Do not freeze. If freezing occurs, bring to room temperature and mix thoroughly. Tordon 101 Mixture: Store in a cool, dry place.

TORDON 202C (picloram + 2,4-D)

DowElanco

1. **FORMULATIONS:** Solution; 12 g/L picloram + 200 g/L 2,4-D; 8 L jug.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Barley (8.7), wheat (7.7)(all types). Timothy and bromegrass being grown for seed production.
   Underseeding: Not recommended for legumes or other sensitive crops.
4. **WEEDS CONTROLLED:**

alsike clover	dandelion (seedlings)	smartweed, green (5.9)
buckwheat,	lamb's-quarters (7.9)	stinkweed (seedlings)(7.1)
[tartary (4.7), wild (7.2)]	mustard, wild (8.6)	thistle, Russian (6.3)
cocklebur	pigweed, redroot (6.7)	(2-4 leaf)

5. **WEEDS SUPPRESSED:** Canada thistle (5.8), perennial sow-thistle (6.4).
6. **WHEN USED:** 3-5 leaf stage of crop. Seedling (2-4 leaf) stage of weeds.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Rate: 810 mL/ac.
   Water Volume: 40-80 L/ac.
   Pressure: 200-275 kPa.
   Nozzles: Flat fan nozzles preferred.
8. **APPLICATION TIPS:** Treat during warm weather when the weeds are young and growing actively. Do not apply to areas where surface water can run off to adjacent cropland or into bodies of water. For applications in timothy and bromegrass, applications should be made prior to shotblade stage of the crop. Applications should not be made after August 1 in the year of seeding. Treatments after that date may result in significant yield reductions in the year following treatment.
9. **HOW IT WORKS:** Absorbed by leaf, stem and roots and translocated throughout the plant to the growing points. A residue of picloram remains in the soil during the growing season and controls some late germinating weeds, like wild buckwheat.
10. **EXPECTED RESULTS:** Death of weeds is not immediate but growth is slowed and eventually ceases. Under certain conditions straw shortening in wheat may occur, but yield will not be affected.
11. **EFFECTS OF RAINFALL:** Rainfall within 4-6 hours of application may reduce activity.
12. **MOVEMENT IN SOIL:** Picloram degrades relatively slowly in soil and water, and may be leached out, after rainfall, from soils extremely low organic matter.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not permit meat animals being finished for slaughter nor dairy animals to forage or graze treated fields within 2 weeks of treatment.
    Drift: Small amounts can damage many desirable broadleaf plants.
    Use of Straw from Treated Fields: Do not use straw from treated crops for composting or mulching on susceptible broadleaf crops. If straw (non-toxic to livestock) is used for bedding or animal feed return the manure to fields to be planted to grain crops, flax, rapeseed, or perennial grasses.
    Rotational Crops: Fields treated in the previous year with Tordon 202C may be seeded to rapeseed (including canola), mustard, flax, wheat, oats, barley, or can be summerfallowed.
    Succeeding Crops: Certain desirable broadleaf crops can be damaged by small amounts of Tordon 202C in the soil. Alfalfa and sunflower should **not** be planted until at least the third growing season after the year of last Tordon treatment. Beans (all types), lentils, peas, and potatoes should **not** be planted until at least the fifth growing season after the year of the last Tordon treatment. An adequately sensitive field bioassay should be done to confirm the treated area is safe before planting a sensitive crop.
    Handling Treated Soils: Treated soil should not be moved to other areas, nor used to grow susceptible broadleaf plants unless an adequately sensitive bioassay shows that no detectable picloram is present. For additional cropping and use information, contact Dow at 1-800-661-6436.
14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = Tordon 202C (1500-2500). May cause eye irritation. Considered non-toxic to fish and bees.
15. **PRECAUTIONS, FIRST AID:** Can be absorbed through the skin and burn skin and eyes. Wear standard protective clothing (see page xx) to avoid exposure. Rubber gloves and goggles should be worn when handling the concentrated formulation. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake may cause convulsions, kidney and liver damage.
16. **STORAGE:** Heated storage. If freezing occurs, warm and mix thoroughly before using.

TREFLAN (trifluralin)

DowElanco
(Cereals)

1. **FORMULATIONS:** Emulsifiable Concentrate; Treflan 545 EC; 545 g/L; 8.3 L jug, 200 L drum. Granular; Treflan QR5; 5%; 25, 725 kg bags.
2. **REGISTERED MIXES:** Treflan QR5: None. Treflan 545 EC: Avadex BW, liquid fertilizer, Avadex BW+liquid fertilizer.
   Mix Restrictions: Add Treflan or Treflan+Avadex directly into the liquid fertilizer, mix thoroughly and apply as soon as possible. Agitate until application is complete.
3. **CROPS:**
   Treflan 545 EC: Barley (8.9), wheat (durum, spring) (8.6).
   Treflan QR5: Barley only.
   Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**
   Treflan 545 EC: Green and yellow foxtail.
   Treflan QR5: See Treflan (Oilseeds).
5. **WEEDS SUPPRESSED:** None.
6. **WEEDS USED:**
   Treflan 545 EC: Alone or with Avadex BW in the spring only after seeding and prior to emergence of crop.
   Treflan QR5: Fall only. September 1 to soil freeze-up. Do not apply on land treated with Treflan or any product containing trifluralin since June 1 of the previous year.
   Note: For fall applications where erosion may be a problem, maximize crop residue cover with only one fall tillage incorporation.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Rate:
   Treflan 545 EC: 445 mL/ac on light to medium textured soil. 610 mL/ac on heavy textured soil.
   Treflan QR5: See Special Use below.
   Water Volume: 45 L/ac.
   Incorporation: Incorporate 2-4 cm with two cross harrowings with tyne or diamond harrows operated at a minimum of 9 km/h.
   Treflan 545 EC: Both incorporations must be done within 24 hours of application.
   Treflan QR5: See Special Use below.
   Pressure: 275 kPa.
8. **APPLICATION TIPS:** Apply only on fields that are trash free or summerfallow fields. Crop must be seeded 5-8 cm deep in a well tilled seedbed to prevent contact between the chemical and the seed.
   Treflan QR5: See Special Use below.
9. **HOW IT WORKS:** Acts on both the root and shoot tips as they emerge. Prevents cell division and affected plants die before emergence. If the shoot portion of the plant escapes to the soil surface, lateral or secondary root growth is inhibited causing a slow death since the plant is unable to gather moisture or nutrients.
10. **EXPECTED RESULTS:**
    Green Foxtail: Seeds germinating in the treated layer die before reaching the soil surface because root and shoot growth are inhibited. Seeds germinating below the treated layer will produce plants that will emerge. The secondary root system of plants that form within the treated layer is completely inhibited by trifluralin present in that area. The affected plant dies slowly as crop competition and temperature stress over-tax the rootless plant's ability to take up moisture. Populations of green foxtail tolerant to trifluralin products including **Treflan** have developed in fields in Western Canada. **Treflan** will not control trifluralin-tolerant green foxtail. Herbicide rotation should be practised to avoid the spread of trifluralin-tolerant green foxtail. Avoid repeated use of trifluralin products in the same field.
    Crop: Crop safety is maintained when seeded to a depth of 5-8 cm.
11. **EFFECTS OF RAINFALL:** No effect once incorporated into the soil.
12. **MOVEMENT IN SOIL:** None.
13. **GRAZING AND CROPPING RESTRICTIONS:** Under normal conditions, Treflan carry over will not harm crops grown in rotation. As a precaution; oats, sugar beets, creeping red fescue, and small-seeded grasses such as timothy, and canary seed, should not be grown following a Treflan treated crop. Not intended for crops grown for forage or hay.
14. **TOXICITY:** Very low acute mammalian toxicity: Acute oral LD_{50} rats (mg/kg) = technical (10,000). In clean water, fish are very sensitive to trifluralin; but in runoff and muddy water, trifluralin binds to the suspended soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Treflan EC is highly flammable. May explode if heated. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake can cause heart, liver and kidney damage. A small amount of vomited liquid inhaled could be fatal.
16. **STORAGE:**
    Treflan 545 EC: If stored below 5°C, bring contents to 15°C for 24 hours and shake well before using.

Treflan QR5: Do not expose to high temperatures or prolonged direct sunlight. Do not let product remain in applicators under these conditions.

17. **RESISTANCE MANAGEMENT:** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, HERITAGE**, TRIFLUREX, FREE FLOW, RIVAL and FORTRESS) will not control trifluralin tolerant green foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use of these products repeatedly in the same field, or use a separate herbicide application for control of trifluralin tolerant green foxtail.

Special Use: Treflan QR5 on barley **only** - Fall application only (September 1 to soil freeze-up).
Weeds Controlled: See Treflan QR5 under Treflan (Oilseeds).
Incorporation: For more effective weed control the second incorporation should be delayed for 3 days.
Rate: Sandy textured, brown and dark brown soil (2-4% O.M.): 6.9 kg/ac. Medium or heavy textured, brown and dark brown soils (2-4% O.M.): 8.9 kg/ac. Sandy textured, black soils (4-6% O.M.): 8.9 kg/ac. Medium or heavy textured, black soils (4-6% O.M.): 11.3 kg/ac.
Warning: Do not apply on soils with less than 2% organic matter or, on deep black soil with more than 6% organic matter. Do not apply on land treated with products containing trifluralin since June 1 of the previous year. Application to severely eroded knolls may result in reduced crop stand. Using press or hoe drill, seed 5 cm deep into a moist, warm seedbed. Avoid seeding into very cold soil. Seeding disease, cold weather, improper seeding depth, excessive moisture, high salt concentration, or drought may weaken crop seedlings and increase the possibility of damage from Treflan.
Note: Similar productsare Free Flow, Rival and Triflurex.

TREFLAN (trifluralin)

DowElanco
(Oilseeds, Special Crops)

1. **FORMULATIONS:** Emulsifiable Concentrate; Treflan 545 EC; 545 g/L; 8.3 L jug; 200 L drum. Granular; Treflan QR5; 5%; 25, 725 kg bags.
2. **REGISTERED MIXES:** Treflan 545 EC: Amiben (soybean, sunflowers); Sencor 500 F or 75 DF [canola (triazine tolerant canola), fababeans]. Liquid nitrogen fertilizer (28-0-0).
Mix Instructions: Pour directly into liquid fertilizer, mix thoroughly and apply as soon as possible with constant agitation.
3. **CROPS:**

alfalfa (establishment)	cabbage	flax**(7.7)	safflower
beans (black, lima)	canola (including	lentils**(8.5)	sainfoin*
beans, dry (kidney, snap,	triazine tolerant)(8.8)	mustard (8.9)	shelterbelts***
white)(8.0)	carrots	peas [field (8.7), canning]	soybeans (8.9)
broccoli (transplant only)	cauliflower	peppers (transplant only)	sunflowers (8.9)
brussel sprouts (transplant	crambe*	rutabaga	sweet clover*
only)	fababeans (8.6)		tomatoes (transplant only)

*Spring only.
**Fall only.
***Shelterbelts: ash (green), caragana, elm (American, Siberian), pine (Scotch).
Alfalfa, beans (snap), broccoli, brussel sprouts, cabbage, carrots, cauliflower, peppers, rutabaga, safflower, sainfoin, sweet clover and tomatoes are registered under the minor use program and may or may not appear on the current product label.
Underseeding: Not recommended.
4. **WEEDS CONTROLLED:**

barnyard grass (8.3)	buckwheat, wild (8.3)	foxtail (green, yellow)(8.1)	oats, wild (7.5)
bluegrass, annual (8.6)	chickweed (7.1)	knotweed	pigweed (8.2)
bromegrass	cockle, cow (9.0)	lamb's-quarters (8.0)	purslane (7.9)
bromegrass, downy (5.9)	darnel, Persian		

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
Treflan 545 EC:
Spring: Alfalfa, beans, canola (including triazine tolerant), crambe, fababeans, mustard, peas, safflower, sainfoin, shelterbelts, sunflowers and sweet clover. Cultivate to destroy existing weeds and apply immediately prior to or, up to 3 weeks before planting.
Summer: Canola (including triazine tolerant), flax and safflower. On summerfallow between June 1 and September 1.
Fall: Beans, canola including triazine tolerant), flax, lentils, mustard, peas, safflower, soybeans, sunflowers. September 1 to soil freeze-up. **Fall application is discouraged where soil drifting is a problem.**
Treflan QR5:
Spring: Not recommended in Alberta.
Summer: Canola (including triazine tolerant), flax. Between June 1 and September 1.

Fall: Alfalfa, beans (dry only), canola (including triazine tolerant), fababeans, flax, lentils, mustard, peas, soybeans, sunflowers. Between September 1 and soil freeze-up.
Note: Not recommended for fall applications where soil erosion may be a problem.

7. HOW TO APPLY:
With: Ground equipment only.
Water Volume: 45 L/ac.
Incorporation: First incorporation must be done within 24 hours of application. Second incorporation should be done at right angles to the first.
Fall Application: It is recommended that both incorporations be completed in the fall.
Spring Application: Apply Treflan 545EC when soil is in good working condition. Ensure early season flush of weeds is killed by first or second incorporation. Seed into a weedfree seedbed using an accepted cultural practice.
Summer Application: The second incorporation (and subsequent incorporations) may be done whenever necessary to destroy resistant weed growth. **Spring tillage** after fall or summer application should be shallow with a disc or field cultivator (vibrashank) set to cut 5-8 cm deep. This should be done when soil is warm enough to promote germination. In areas with high wild oat populations prework early in the spring with a shallow cultivation to promote weed seed germination, followed by a 5-8 cm deep cultivation prior to seeding to destroy existing green growth. Avoid transplanting weed seedlings and seed into a weed free seedbed.
Treflan QR5: Delay second incorporation for 3 days. This allows time for greater release of QR5 into the soil and assures a more uniform distribution.
Flax, Lentils: Both incorporations of Treflan 545 EC or QR5 must be done in the fall. Fall or summer application should be followed by a spring tillage to a 5-8 cm depth before seeding.
Implements: A tandem disc, discer, or field (vibrashank) cultivator are recommended for incorporating to 8-10 cm. Operate discs at 6-10 km/h and cultivator at 10-13 km/h. A tandem disc gives the best mixing action on stubble conditions Do not use a field cultivator to incorporate Treflan when soil is crusted, lumpy, or too wet for good mixing.
Pressure: 275 kPa.
Rate:

Season	Soil Zone; Organic Matter	Soil Texture	Treflan 545 EC Quantity/ac
Spring	Brown, Dark Brown, Black; 2-6%	Sand to Sandy Loams	610 mL
		Silts to Loams to Clays	810 mL
	Black, Deep Black; 6-15%	Sand to Sandy Loams	810 mL
		Silts to Loams to Clays	810 mL-1.05 L*

Season	Soil Zone; Organic Matter	Soil Texture	Treflan 545 EC Quantity/ac
Fall	Brown, Dark Brown, Black; 2-6%	Sand to Sandy Loams	810 mL
		Silts to Loams to Clays	1.05 L
	Black, Deep Black; 6-15%	Silts to Loams to Clays	1.05-1.2 L*
Summer	All Soil Zones	Silts to Loams to Clays only	1.2 L

Note: * Higher rate for heavy wild oat infestations.

Season	Soil Texture; Organic Matter	Treflan QR5 Quantity/ac
Spring	Not recommended in Alberta.	NR*
Fall	Sand to Sandy Loams; Less than 6%	8.9 kg
	Silts to Loams to Clays; Less than 6%	11.3 kg
	All Soils; 6-15%.	11.3-13.7** kg
Summer	Silts to Loams to Clays only	13.7 kg

Note: *NR-Not Recommended.
**Higher rate for heavy wild oat infestations.
Shelterbelts: Sands to sandy loams; 2-6% O.M. 1.65 L/ac 545 EC. Silts to loams to clays; 6-15% O.M. 3.3 L/ac 545 EC.

8. APPLICATION TIPS: To avoid concentrating wild oat seeds below the treated layer, do not plow land prior to Treflan application. Do not apply to fields spread with manure during the last 12 months. Do not apply Treflan 545 EC to soils with more than 20-25% straw cover or on standing weeds. On stubble, chop and thoroughly mix residues into the soil prior to addition of Treflan EC. If the swath from the previous crop was removed by burning, cultivate once to remove charcoal layer prior to Treflan application. Treflan QR5 can be used when trash is heavier or on standing weeds, provided they do not interfere with the distribution of the granule and do not limit incorporation. Do not apply on soils that are wet, in poor tilth, or contain 15% or more organic matter. Do not apply on soils subjected to prolonged periods of flooding.
Flax, Lentils: Shallowly till and pack the soil in the spring to ensure a firm seedbed and accurate depth for seeding. Seed into a well packed, warm, moist seedbed. Do not seed deeper than 4 cm.
Triazine Tolerant Canola: Sencor or Bladex TTC may be applied as a sequential treatment after crop emergence to control several additional weeds.

9. **HOW IT WORKS:** Kills seedlings as they germinate. Inhibits cell division in the actively growing points of root and shoot. It does not control established weeds.
10. **EXPECTED RESULTS:**
    Weeds: Most die before emerging. Weeds will exhibit swelling in the coleoptile region, stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture obtaining ability.
11. **EFFECTS OF RAINFALL:** No effect once Treflan is incorporated into the soil.
12. **MOVEMENT IN SOIL:** None.
13. **GRAZING AND CROPPING RESTRICTIONS:** None.
    Crop Use After Hail: No restrictions.
    Succeeding Crops: Normally, Treflan carry over not harm crops grown in rotation. As a precaution, oats, sugar beets, creeping red fescue, and small-seeded grasses such as timothy and canary seed should not be grown in rotation following a Treflan treated crop. Drought conditions in the year of treatment may result in higher levels of trifluralin carry over into the next year, to avoid wheat injury, seed less than 7 cm deep into a warm moist seedbed. Overapplication caused by overlapping or improper calibration or non-uniform application may reduce the stand of crop grown in rotation. Also, application to severely eroded knolls may result in reduced crop stand or rotational crop injury.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = technical (10,000). In clean water, fish are very sensitive to trifluralin, but in runoff or muddy water, it binds to soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Treflan EC is highly flammable. May explode if heated. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake can cause heart, liver and kidney damage. A small amount of vomited liquid inhaled can be fatal.
16. **STORAGE:** Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.
    Note: Similar products are Advance, Free Flow, Rival and Triflurex.
17. **RESISTANCE MANAGEMENT:** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, HERITAGE**, TRIFLUREX, FREE FLOW, RIVAL and FORTRESS) will not control trifluralin tolerant green foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use of these products repeatedly in the same field, or use a separate herbicide application for control of trifluralin tolerant green foxtail.

TRIFLUREX (trifluralin)

Makhteshim-Agan
(Cereals)

CAUTION POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 400 g/L; 22.7 L containers.
2. **REGISTERED MIXES:** Avadex BW (barley, wheat), Avadex BW+liquid nitrogen fertilizer (28-0-0), liquid nitrogen fertilizer (28-0-0).
   Mix Restrictions: Add Triflurex or Triflurex+Avadex directly into the liquid fertilizer, mix thoroughly and apply as soon as possible. Agitate until application is complete.
3. **CROPS:** Barley, wheat (durum, spring).
   Underseeding: Not recommended.
4. **WEEDS CONTROLLED:** Green foxtail.
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Apply alone or as a tank mix with Avadex BW in the spring after seeding and prior to emergence of wheat or barley.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Rate: Sandy to loamy soils: 565 mL/ac. Clay type soils: 850 mL/ac.
   Water Volume: 40 L/ac.
   Incorporation: Incorporate 2-4 cm with 2 cross harrowings with tyne or diamond harrows operated at a speed of at least 8 km/h. Where possible spray and incorporate in the same operation. Incorporate twice within 8 hours.
   Pressure: 275 kPa.
8. **APPLICATION TIPS:** Apply only on fields that are trash free or summerfallow. Apply only to soils with less than 15% organic matter which are dry and in good working condition. Do not treat soils that have the potential of becoming water-logged. Crop must be seeded 5-8 cm deep in a well tilled seedbed to prevent contact between the chemical and the seed.

9. **HOW IT WORKS:** Acts on both the root and shoot tips as they emerge. Prevents cell division and affected plants die before emergence. If the shoot portion of the plant escapes to the soil surface, lateral or secondary root growth is inhibited causing a slow death since the plant is unable to gather moisture or nutrients.
10. **EXPECTED RESULTS:**
Green Foxtail: Seeds that germinate below the treated layer will produce plants that will emerge. The secondary root system of plants that form within the treated layer is completely inhibited by trifluralin present in that area. The affected plant dies slowly as crop competition and temperature stress over-tax the rootless plant's ability to take up moisture.
Crop: Crop safety is maintained when seeded to a depth of 5-8 cm. **Poor results may be expected if** conditions causing seedling stress, such as wet soils, incorrect planting depth, seedling disease, low temperatures, excessive salt in soil, or drought could bring about damage to the crop.
11. **EFFECTS OF RAINFALL:** No effect once incorporated into the soil.
12. **MOVEMENT IN SOIL:** None.
13. **GRAZING AND CROPPING RESTRICTIONS:** None.
Succeeding Crops: Under normal conditions there will not be a carry over. As a precaution, creeping red fescue, oats, sugar beets, small-seeded grasses such as canary seed or timothy should not be grown in rotation following a trifluralin treated crop.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (10,000). In clean water, fish are very sensitive to trifluralin; but in runoff and muddy water, trifluralin binds to the suspended soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Highly flammable. Could explode if heated. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake can cause heart, liver and kidney damage. A small amount of vomited liquid inhaled could be fatal.
16. **STORAGE:** Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.
Note: Similar products are Free Flow, Rival and Treflan.
17. **RESISTANCE MANAGEMENT:** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, HERITAGE**, TRIFLUREX, FREE FLOW, RIVAL and FORTRESS) will not control trifluralin tolerant green foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use of these products repeatedly in the same field, or use a separate herbicide application for control of trifluralin tolerant green foxtail.

TRIFLUREX (trifluralin)

Makhteshim-Agan
(Oilseeds, Special Crops)

CAUTION POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 400 g/L; 22.7 L containers.
2. **REGISTERED MIXES:** Liquid nitrogen fertilizer (28-0-0).
Mix Instructions: Pour directly into liquid fertilizer, mix thoroughly and apply as soon as possible with constant agitation.
3. **CROPS:**
Underseeding: Not recommended.

beans, black	canola (8.8)(including	crambe*	peas [canning, field (8.7)]
beans [dry (field, kidney)]	triazine tolerant)	fababeans (8.6)	shelterbelts**
		mustard (8.9)	sunflowers (8.9)

*Spring application only.
**Ash (green), caragana, elm (American, Siberian), pine (Scotch).

4. **WEEDS CONTROLLED:**

bluegrass, annual (8.6)	chickweed (7.1)	grass barnyard (8.3)	pigweed (8.2)
bromegrass	cockle, cow (9.0)	knotweed	purslane (7.9)
bromegrass, downy (5.9)	darnel, Persian	lamb's-quarters (8.0)	thistle, Russian (7.9)
buckwheat, wild (8.3)	foxtail (green, yellow) (8.1)	oats, wild (7.5)	

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
Fall: September 1st to freeze-up. **Fall incorporation is discouraged where soil drifting is a problem.**
Spring: Cultivate to destroy existing weeds. Apply immediately prior to, or up to 3 weeks before planting.
Summer: Canola only; on summerfallow between June 1st to September 1st.
Shelterbelts (transplanted): Apply prior to transplanting seedlings.
7. **HOW TO APPLY:**
With: Ground equipment.
Water Volume: 40 L/ac.

Incorporation: First at a right angle, within 8 hours of application. Fall application should be followed with 2 incorporations at right angles, before freeze-up. A tandem disc, discer, or field (vibrashank) cultivator is recommended for incorporating to 7.5-10 cm. For best results, operate disc implement at 6.5-10 km/h; cultivator at 10-13 km/h.
Pressure: 275 kPa.
Rate:
Fall:
(a) 1.1 L/ac on sandy, sandy loam soils; less than 6% organic matter.
(b) 1.4 L/ac on loamy to clay type soils; 6-15% organic matter, and low to medium wild oat infestations.
Spring:
(a) 810 mL/ac on sandy, sandy loam soils; less than 6% organic matter.
(b) 1.1 L/ac on loamy to clay type soils; 6-15% organic matter; low to medium wild oat infestations.
Summer: 1.7 L/ac on all soils.
Shelterbelts (transplanted):
(a) 2.2 L/ac on sandy, sandy loam soils; less less than 6% organic matter.
(b) 4.4 L/ac on loamy to clay type soils; 6-15% organic matter.

8. **APPLICATION TIPS:** Do not apply on soils that are wet, in poor tilth, or contain 15% or more organic matter. To avoid concentrating wild oat seeds below the treated layer, do not plow land prior to Triflurex application. Use on soils with less than 20-25% straw cover. On stubble, chop and thoroughly mix residues and weed growth into the soil before application. A tandem disc mixes best on stubble or poor condition soils (crusted, lumpy, or wet). Fall or summer applications should be followed by a light spring tillage to a 5-8 cm depth before seeding. Do not apply with air seeder as it gives non-uniform seeding depth and patchy germination.
9. **HOW IT WORKS:** Kills seedlings as they germinate. Inhibits cell division in actively growing points of root and shoot.
10. **EXPECTED RESULTS:**
Weeds: Most die before emerging. Weeds will exhibit swelling in coleoptile region, stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture-obtaining ability.
11. **EFFECTS OF RAINFALL:** No effect once Triflurex is incorporated into the soil.
12. **MOVEMENT IN SOIL:** None.
13. **GRAZING AND CROPPING RESTRICTIONS:** None.
Crop Use After Hail: No restrictions.
Succeeding Crops: Normally, carry over will not harm crops grown in rotation. As a precaution, creeping red fescue, oats, sugar beets, small-seeded grasses such as canary seed or timothy should not be grown in rotation following a trifluralin treated crop. Drought conditions in year of treatment may result in higher levels of carry over into the next year. To avoid wheat injury, seed less than 7 cm deep into a warm moist seedbed.
14. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (10,000). In clean water, fish are very sensitive, but in runoff or muddy water, it binds to soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Highly flammable. Could explode if heated. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake can cause heart, liver and kidney damage. A small amount of vomited liquid inhaled could be fatal.
16. **STORAGE:** Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.
Note: Similar products are Free Flow, Rival and Treflan.
17. **RESISTANCE MANAGEMENT:** Populations of green foxtail tolerant to trifluralin have developed in a number of fields in Western Canada which have had a long history of repeated trifluralin use. Trifluralin or ethalfluralin containing products (i.e. ADVANCE 10G*, TREFLAN*, EDGE*, HERITAGE**, TRIFLUREX, FREE FLOW, RIVAL and FORTRESS) will not control trifluralin tolerant green foxtail. To delay selection or reduce the spread of trifluralin tolerant green foxtail, avoid use of these products repeatedly in the same field, or use a separate herbicide application for control of trifluralin tolerant green foxtail.

TRIUMPH PLUS (fenoxaprop-ethyl + MCPA + thifensulfuron)

Hoechst

WARNING POISON

1. **FORMULATION:**
1. Fenoxaprop-ethyl; Emulsifiable Concentrate; 90 g/L; 18 L container.
2. MCPA (e); Emulsifiable Concentrate; 500 g/L; 6.8 L container.
3. Thifensulfuron; Dry Flowable; 75%; 162 g container.

2. **REGISTERED MIXES:** None.
3. **CROPS:** Hard red spring wheat. Do not apply to durum wheat or barley.

4. WEEDS CONTROLLED:

buckwheat, wild
burdock
chickweed
cocklebur
cockle, cow
flixweed*
foxtail, green and yellow
green smartweed
hemp-nettle
hoary cress**
horsetail, field**
kochia
lady's-thumb
lamb's-quarters
mustards (except dog and green tansy)
oats, wild
pigweed (redroot and Russian)
plantain**
prickly lettuce
radish, wild
ragweeds
rapeseed, volunteer
Russian thistle*
shepherd's-purse
spurry, corn
stinkweed
sunflower, annua
vetch

*Spring seedings only.
**Top growth control only.

5. WEEDS SUPPRESSED: None.

6. WHEN USED:

Crop: Apply when the crop is in the 2 leaf to flag leaf growth stage.
Annual Grassy Weeds: Wild oats and foxtail (green and yellow) - apply when the weeds are in the 1 to 6 leaf stage of growth (1 leaf to early tillering).
Broadleaf Weeds: Annual sunflower, ball mustard, burdock, cocklebur, field horsetail, flixweed, hoary cress, kochia, mustards, plantain, prickly lettuce, ragweeds, Russian pigweed, shepherd's-purse, vetch and wild radish - apply at 2-4 leaf stage; corn spurry, cow cockle, green smartweed, hemp-nettle, lady's-thumb, lamb's-quarters, redroot pigweed, Russian thistle, stinkweed, volunteer rapeseed and wild mustard - apply when weeds are less than 10 cm tall or across; chickweed - apply at 1-6 leaf stage; wild buckwheat - apply at 1-3 leaf stage. Apply to emerged, young actively growing weeds. Weeds that emerge after application will not be controlled.
Note: Treatment at the 3 to 4 leaf stage of crops and weeds usually combines maximum crop tolerance and weed susceptibility. Some broadleaf weeds may not be controlled if infestation is heavy, weeds are in bud or weather is dry and cool.

7. HOW TO APPLY

With: Ground equipment. Do not apply by aircraft.
Rate:
Fenoxaprop-ethyl - .89 L/ac.
MCPA (e) - .34 L/ac.
Thifensulfuron - 8.1 g/ac.
*One case treats 20 acres.
Water: 45 L/ac.
Pressure: Ground - 275 kPa.
Nozzles: Only 110 degrees or 80 degrees stainless steel flat fan nozzles are recommended. Uniform, thorough coverage is important to achieve good control.
Mixing Instructions:

1. Assure that the spray tank is thoroughly clean.
2. Fill the tank half full with clean water and start agitation or bypass system.
3. Slowly add the correct amount of thifensulfuron (container #1) to the spray tank. Agitate thoroughly until completely in suspension.
4. Add the correct amount of MCPA (container #2) and continue agitation.
5. Add the correct amount of fenoxaprop-ethyl (two containers marked #3) and continue agitation.
6. Add the remaining amount of water while agitation continues. Spray out immediately. Spray mixture should not be left in tank overnight.
7. On repeat loads, prepare a thifensulfuron slurry in water by slowly adding the correct amount of thifensulfuron to 20 litres of water, and add to spray tank. Agitate thoroughly until completely in suspension. Repeat steps 4, 5 and 6.

Sprayer Cleanup:
To avoid subsequent injury to other crops, immediately after spraying and prior to spraying other crops, thoroughly remove all traces of Triumph Plus Tank Mix from mixing and spray equipment as follows:

1. Drain tank; then flush tank, boom and hoses with clean water for a minimum of ten minutes to remove all visible residues.
2. Fill the tank with clean water then add .5 L chlorine bleach (containing 5.25-6.0% sodium hyperchlorite) per 100 L of water. Fill boom and hoses with solution and allow sprayer to sit for 15 minutes and then drain.
3. Repeat step 2.
4. Nozzles and screens should be removed and cleaned separately. To remove traces of chlorine bleach, rinse the tank, hoses and booms thoroughly with clean water.

Caution: Do not use chlorine bleach with ammonia. All traces of liquid ammonia, ammonium nitrate or ammonium sulphate must be rinsed with water from the mixing and application equipment before adding chlorine bleach solution. Failure to do so will release a gas with a must chlorine odour which can cause eye, nose, throat and lung irritation. Do not clean equipment in an enclosed area.

8. **APPLICATION TIPS:** Do not treat hard red spring wheat underseeded to forages. During periods of stress, plants are not actively growing. When daytime temperatures before or after application are very hot (28° C or 82° F) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Triumph Plus tank mix during these periods may result in substantially reduced control. Application of the spray at a forward angle of 45° will result in better penetration of the canopy and better coverage. Do not apply to crop that is stressed by severe weather conditions, frost, low fertility, drought, water saturated soil, disease or insect damage as crop injury may result.
9. **HOW IT WORKS:**
   Fenoxaprop-ethyl: Contact as well as systemic, no soil activity. Regions of high meristematic activity, such as root and shoot tips are known to be affected. MCPA: disrupts cell division and causes abnormal growth responses that affect respiration and food reserves. Thifensulfuron: absorbed by foliage. Inhibits cell elongation.
10. **EXPECTED RESULTS:** Grassy weeds - reduction of leaf growth and chlorotic blotching within 1-3 days after application. Initial development of leaf chlorosis within 5-8 days after application and complete death within 14-21 days after application. Broadleaf weeds - growth stops almost immediately. Discoloration of dying weeds may not be noticeable for 1-3 weeks after application depending on growing conditions and weed susceptibility. **Poor results may be expected if** improper mixing, timing, coverage, or when weeds are under drought stress.
11. **EFFECTS OF RAINFALL:** Do not apply Triumph Plus if rain is expected within 4 hours.
12. **MOVEMENT IN SOIL:** Fenoxaprop-ethyl appears to undergo rapid hydrolysis in the soil. MCPA is readily leached from the soil. Thifensulfuron moves little in the soil and has a very short life in the soil.
13. **GRAZING RESTRICTIONS:** Do not graze treated fields prior to harvest. Pre-harvest interval: 80 days.
14. **TOXICITY:** Fenoxaprop-ethyl - low acute mammalian toxicity. Accute oral LD_{50} rats (mg/kg) = 1510; MCPA - moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical 700-880: Thifensulfuron - low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = 5,000.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing. **If in eyes or on skin** use standard first aid measures. **If swallowed** seek medical attention.
16. **STORAGE:** Keep away from fire or open flame or other sources of heat. **Cannot** be stored below freezing. If stored for 1 year or longer, shake well before using. Store the tightly closed containers away from seeds, fertilizer, plants and foodstuffs. Do not use or store in or around the home.
17. **RESISTANCE MANAGEMENT:** Some naturally occurring populations of certain weeds listed on this label will not be controlled by Plus, Refine, Ally, Muster or Glean. These populations are able to survive a use rate several times higher than needed to control susceptible populations. Triumph Plus tank mix will delay selection for resistant populations of weeds that are normally controlled or suppressed by MPCA and Plus. To delay selection for resistant populations of weeds not controlled by MCPA, rotate the use of Triumph Plus tank mix, Refine, Ally, Muster and Glean repeatedly in the same field.

TROPOTOX PLUS (MCPB + MCPA)

Rhône - Poulenc

CAUTION POISON

1. **FORMULATIONS:** Water Soluble Solution; 375 g/L MCPB + 25 g/L MCPA; 8 L container.
2. **REGISTERED MIXES:** None.
3. **CROPS:**

barley (8.8)	corn (field)	peas (7.2)
clover seedlings	oats	rye (fall)
[alsike (7.2), Ladino, red, white Dutch, wild white]	pasture	wheat (spring)(8.9)

   Underseeding: Clover can be used on barley, oats, wheat companion crops.
4. **WEEDS CONTROLLED:**

dock, curled	plantains	shepherd's-purse (5.0)
lamb's-quarters (8.1)	ragweed	stinkweed (7.5)
mustard (ball, wild, wormseed)(7.9)	rapeseed, volunteer	thistle, bull
pigweed, redroot (7.4)		

5. **WEEDS SUPPRESSED:**

bindweed, field (3.2)	hemp-nettle (5.9)	sow-thistle [annual (5.4), perennial]
buttercup (creeping, tall)	horsetail	thistle, Canada
	radish, wild	

6. **WHEN USED:**
   Cereals: 2 leaf to flag leaf stage.
   Clover: 1-4 true leaf stage.
   Corn: After 45 cm high but before tasseling begins, with drop nozzles.
   Pasture: After grazing or cutting.

Peas: 3-6 expanded leaves.
Important: Damage may be caused particularly in early maturing varities, if spraying is carried out after this stage.
Annual Weeds: Seedling stage.
Bull thistle: Rosette to early bud stage.
Bindweed, buttercups: In spring when growth is vigorous.
Canada thistle: 15 cm to early bud stage.
Curled dock, perennial sow-thistle, plantains: Young plants in rosette stage.
Horsetail: When 15 cm tall.

7. **HOW TO APPLY:**
With: Ground equipment.
Rate: 1.1-1.7 L/ac depending on weeds to be controlled.
Water Volume: 60-80 L/ac.
Pressure: 275 kPa.
8. **APPLICATION TIPS:** Spray in warm weather when plants are actively growing. Peas: Spray when growing conditions are good and the peas are not under stress from drought or disease.
9. **HOW IT WORKS:** A systemic, absorbed by leaves and stems, translocated to actively growing regions, disrupts cell division, ceases cell growth and interferes with respiration and food reserves. Selectivity based on ability of plant to efficiently convert MCPB to MCPA.
10. **EXPECTED RESULTS:**
Broadleaf weeds: Should be dead within 2-3 weeks of treatment. **Poor results may be expected if** water volume is incorrect or weeds are too mature.
11. **EFFECTS OF RAINFALL:** Rainfall before the foliage has dried from the spraying may decrease activity.
12. **MOVEMENT IN SOIL:** Readily leached from soil. Longer residual in dry soil.
13. **GRAZING AND CROPPING RESTRICTIONS:** None specified.
14. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (500). Non-toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Can cause burns to the skin and eyes. Wear standard protective clothing (see page xx) to avoid exposure. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. Intake can cause convulsions and coma.
16. **STORAGE:** Store in heated area.

VELPAR (hexazinone)

DuPont

CAUTION FLAMMABLE

1. **FORMULATIONS:** Soluble Powder; Velpar; 90%; 25 kg bag. Water Dispersible Solution; Velpar L; 240 g/L; 3.78 L jugs; Velpar Toss-N-Go; 90%; 5 X 500 gram bags.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Established seed Alfalfa for selective weed control. Non-crop areas as an industrial herbicide for total vegetation control. Forestry use for weed and deciduous brush control in coniferous woodland plantations [fir (balsam), pine (red), spruce (black, white)].Velpar L used for weed and deciduous brush control in coniferous woodland plantations [fir (balsam), pine (red), spruce (black, white)].
4. **WEEDS CONTROLLED:**
Alfalfa: dandelion, quackgrass, sow-thistle.
Non-Crop:

bedstraw	dogbane, spreading	lamb's-quarters	spurge, Cypress
bindweed, field	goldenrod	milkweed	thistle, Canada
bromegrass	grape, wild	mullein	toadflax
burdock	grasses (annual, perennial)	poison-ivy	vetch, purple
campion, bladder	ground-ivy	ragweed, common	vine trumpet
carrot, wild	hemp-nettle	ragwort, tansy	
dandelion	horsetail	raspberry, wild	

Forestry: Ash, birch, cherry, maple, poplar (aspen).
5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:**
Established Seed Alfalfa:
(Velpar L): Apply in late fall or early spring when alfalfa is dormant. It must be seed alfalfa established for at least 18 months.
Non-Crop (Herbaceous weed control):
Velpar and Toss-N-Go Velpar: Just before or soon after weed emergence. Do not apply to frozen or snow covered soil.

Forestry:
Conifer Site Preparation (Velpar L): In spring after ground has thawed.
Undiluted Spot Treatment for Brush (Velpar L): To unthawed ground in spring or early summer.

7. **HOW TO APPLY:**
Established Seed Alfalfa:
With: Ground equipment.
Rate: 0.85 - 1.7 L/ac. Applied to dormant, established alfalfa.
Water Volume: 81 L/ac.
Pressure: 210 kPa.
Non-Crop and Forestry:
With: Fixed boom sprayer, handgun, back pack sprayers, a watering can for smaller areas, or a spot gun.
Rate:
Velpar:
Contact Kill or Short Term (3 months): 1.1-1.8 kg/ac as a foliar spray.
More than 1 Season: 1.8-3.6 kg/ac as a foliar spray. Higher rates on clay or clay loam soils and on soils with more than 5% organic matter.
Velpar L:
Conifer Site Preparation: 3.6-7.2 L/ac. Black or white spruce and jack pine may be planted immediately after the 3.6 L/ac application, but should **not** be planted until a year after application at higher rates.
Undiluted Spot Treatment for Brush: 0.75-1.50 mL for each 1 cm of stem diameter (breast height) of plants to be controlled. Direct treatment within 0.5 m of the root collar of plants to be controlled and at least 1.0 m from desirable conifers.
Water Volume: Handgun, minimum of 650 L/ac of spray solution. Velpar L: at least 5 L of water for each L of Velpar L.

8. **APPLICATION TIPS:** Avoid overlapping spray swaths. **Do not apply to slopes as soil erosion may occur.**
Velpar: do not apply when vegetation is dormant or semi-dormant as the treatment may not be effective.
Velpar L: do not use on gravelly or rocky soils, exposed subsoil, or sandy soils.
Velpar L: since the effect on conifers varies with soil type, uniformity of application, and environmental conditions, it is suggested growers first test Velpar L on small areas.

9. **HOW IT WORKS: A systemic herbicide readily absorbed through the roots and foliage and translocated upwards. Inhibits photosynthesis.**

10. **EXPECTED RESULTS: Plants become chlorotic soon after treatment and then die. Rainfall will increase efficacy. Poor results may be expected if** there is inadequate application rate, weed growth too mature, insufficient rainfall, or application on areas subject to severe soil erosion.

11. **EFFECTS OF RAINFALL:** Rainfall less than 4 hours after application may affect the contact activity.

12. **MOVEMENT IN SOIL:** Velpar moves downward in the soil to the root zone of woody species.

13. **GRAZING AND CROPPING RESTRICTIONS:**
Alfalfa: Do not graze the treated crop or cut for hay (there is insufficient data available to support such use). Do not seed any crop following alfalfa that has been treated with Velpar L until a successful field bioassy shows that the crop in question may be grown safely. A successful field bioassy means growing to maturity a test strip of the crop across the field. Persistence of Velpar L in the soil is influenced by temperature, rainfall, soil type and organic matter. Seeding of field bioassys is not recommended less than 24 months after the last Velpar application.

14. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (1,690). May cause some eye irritation. Slightly toxic to fish.

15. **PRECAUTIONS, FIRST AID:** Wear goggles or face shield when applying. Velpar irritates eyes. Velpar L is corrosive to eyes and flammable. Keep away from heat, sparks, and open flame. Wear standard protective clothing (see page xx). **If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention.

16. **STORAGE:** Store in a cool, dry place. Keep away from heat, sparks, and open flame.

WEEDONE CB (2,4-D + dichlorprop)

Rhône - Poulenc

WARNING POISON

1. **FORMULATIONS:** Ready-to-apply formulation; 80 g/L 2,4-D + 80 g/L dichlorprop; 10 L jug.

2. **REGISTERED MIXES:** None.

3. **CROPS:** Non-crop areas (fence rows, industrial areas, rights-of-way, roadsides), forest, woodlands.
Underseeding: Not applicable.

4. **WEEDS CONTROLLED:**

alder (red, speckled)	cherry (black, choke, pin)	maple (Manitoba, red,* sugar	snowberry, western
ash (green, white*)	elm (American, red)	silver*)	sumac
basswood (American)	hawthorn	oak (bur, red, white)	walnut
beech (American)	honeysuckle	poplar (aspen, balsam)	willows
birch (gray,* white)	ironwood	rose, wild	

*With basal bark applications, treat at least 100 cm of the stem of these species.

5. **WEEDS SUPPRESSED:** None.
6. **WHEN USED:** Year round; will not freeze during storage or application.
7. **HOW TO APPLY:**
   With: Knapsack sprayer.
   Rate: 20 L/ac normally. Rate depends on amount and size of brush being treated. Basal bark applications normally require less than 5 mL/stem.
   Water Volume: None, ready-to-apply formulation. Spray bark until wet only, rather than runoff.
   Pressure: 100 kPa is optimal for most applications. Do not use over 140 kPa.
   Nozzles: Spraying Systems 5500 adjustable ConeJet nozzles with Y series orifices, 200 mesh screens.
8. **APPLICATION TIPS:** Weedone CB may affect O rings and other seals in certain sprayer units. The most effective method of minimizing this problem is to drain the sprayer completely every evening. Weedone CB can be returned to the original container. Do not allow contact with desirable vegetation.
   Basal bark applications: Apply to lower 50 to 100 cm of plant stem. Treat all around the stem including root collar and any exposed roots. It is not necessary to use so much product that it puddles at the root collar. Use the stump treatment for any plant with a diameter of more than 10 cm at breast-height.
   Stump applications: Control stems with a breast-height diameter of more than 10 cm by cutting the tree and thoroughly treating the bark, root collar, and any exposed roots of the remaining stump. The stumps can be any height as long as all the remaining wood, bark, and roots are thoroughly treated. Stumps do not require immediate treatment, permitting separate cut and spray operations for greater efficiency.
9. **HOW IT WORKS:** Contains a penetrant which allows the herbicide to be effectively absorbed through the bark. It is not necessary to cut or frill prior to application.
10. **EXPECTED RESULTS:** Spring or summer applications will cause leaves to brown and wilt that season, no leaves appear the following year. Fall or winter treated stems may briefly leaf out in the following season but will die shortly afterwards. Herbacious plants may die around base of brush sprayed.
11. **EFFECTS OF RAINFALL:** None.
12. **MOVEMENT IN SOIL:** Leaching does not pose a problem.
13. **GRAZING AND CROPPING RESTRICTIONS:** No grazing restrictions.
14. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = Toxic to fish.
15. **PRECAUTIONS, FIRST AID:** Can be absorbed through skin and cause burns to skin and eyes. Wear standard protective clothing (see page xx). Wear eye protection and impermeable gloves. **If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention.
16. **STORAGE:** Store in tightly closed containers. Not damaged by freezing.

PLANT GROWTH REGULATOR

CERONE (ethephon)
Rhône - Poulenc

DANGER CORROSIVE

1. **FORMULATIONS:** Liquid Solution; 480 g/L; 5 L jug.
2. **REGISTERED MIXES:** None.
   Mixing Instructions: To 1/2 required amount of water add Cerone, start agitation, then add the rest of water. Maintain gentle agitation at all times.
   Mixing Restrictions: Do not add surfactants or wetting agents as it may result in severe crop injury and reduced yields. Do not allow mixed solutions to stand overnight.
3. **CROPS:** Barley (all spring varieties except Birka), wheat (all spring varieties).
4. **WHEN USED:** When most of the tillers are between early flag leaf emergence to swollen-boot stage (Zadoks stages 37 to 45). Do not apply after more than 10% of the awns have emerged (Zadoks stage 49). Correct timing is critical for successful results and to ensure crop safety.
5. **HOW TO APPLY:**
   With: Aircraft or Ground equipment. Do not use control droplet applicators, Sprafoils, Spra-Coupes, or floaters.
   Water Volume: Aircraft: 12 L/ac minimum; Ground: 40-120 L/ac.
   Pressure: Ground: 275 kPa.
   Nozzles: Flat fan nozzles recommended.
   Rate:

Crop	Quanity/ac
Barley (2 row; spring)	200-300 mL
Barley (6 row; spring)	200-400 mL
Wheat (spring)	200-300 mL

   Use the lower rate unless lodging conditions are expected to be severe. Use the higher rates on crops that are heavily fertilized, have ample moisture and are prone to lodging.
6. **APPLICATION TIPS:** To prevent permanent staining of painted surface, wash all equipment at end of each spray operation. Do not apply to crops which are under stress such as drought, excessive moisture, excessive heat, disease, or crops which have already lodged. as severe yield reductions may result.
7. **HOW IT WORKS:** Uptake primarily through the leaves and stem. Very little translocation throughout the plant.
8. **EXPECTED RESULTS:** Cerone acts by releasing ethylene in the plant tissues which reduces cell elongation and plant height, usually by 2-15 cm. Cerone applications also strengthen the straw. An occasional delay in maturity may occur. This is normally not greater than 5 days and is generally less than that caused by lodging.
9. **EFFECTS OF RAINFALL:** Rainfall within 5 hours will decrease activity.
10. **MOVEMENT IN SOIL:**
11. **GRAZING AND CROPPING RESTRICTIONS:**
    Drift: Avoid drift onto nearby crops as modifications in growth may result.
    Grazing Restrictions: Do not graze treated green crop. Treated straw may be fed to livestock.
    Harvest Restrictions: Do not apply within 35 days of harvest.
    Succeeding Crops: No restriction.
12. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (4,229). Highly acidic and highly corrosive; contact will cause skin irritation. Over exposure may cause nausea. Inhalation may cause irritation of mucous membranes. Eye contact may cause eye damage.
13. **PRECAUTIONS, FIRST AID:** Highly corrosive. Wear standard protective clothing (see page xx) plus rubber gloves, goggles, and respirator when handling Cerone. **If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention.
14. **STORAGE:** Do not freeze.

INSECTICIDE INDEX

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CHEMICAL INSECT CONTROL IN ALBERTA

The degree of infestation and the severity of insect damage vary drastically from area to area and season to season. Some pests, such as grasshoppers and bertha armyworms, require control during periods of abundance which may last from one to several years. Other pests are perennial. For example, sugar beet root maggot is controlled by the application of a granular insecticide with the seed at planting time.

To insure proper use of insecticides identify the pest, learn its biology, check your fields and do not panic when you see an insect in your crop. Obtain information on pending pest problems and keep in mind the previous years' problems so you are prepared for changes in insect population levels.

Chemical Control

Attention to the following points should lead to more effective control: Insecticides will kill the pest insect if applied properly at a stage when the pest is susceptible. An application that is made too early or too late in the life cycle may not provide adequate control and would be wasteful. Follow label instructions for proper application. Learn the biology of the pest. Base control decisions on the amount of foliage, weather conditions, age and size of the insect and dosage required. Most insecticides have limited residual control properties when applied to foliage. If insects are moving into crops or emerging over an extended period, several applications in the same season may be necessary.

Safety

In general, insecticides are more toxic to humans, wildlife, fish, bees and other non-target organisms than herbicides. Follow label directions for safety precautions associated with application of each insecticide. Refer to first section for general inform ation on pesticide toxicity, exposure, safety precautions, protective equipment, symptoms, first aid, poison control centres, and disposal. Specific information on safety is included with each insecticide.

Bee Safety

Honey bees and other pollinators are susceptible to most insecticides. If applications are made to weeds or crops in bloom, severe pollinator mortality may occur. To reduce this risk, apply insecticides in late evening (most preferred) or early morning when bees are not flying. Advise beekeepers in the area to be sprayed at least 48 hours before application. Never allow insecticide spray to drift directly onto an apiary site. Do not apply insecticides to water bodies.

Livestock and Residues

The number of days between application of an insecticide and harvesting, feeding to livestock, or grazing is given on the label. These restrictions must be followed to prevent illegal residues and eliminate hazards to consumers. Follow label instructions.

The Guide

This guide includes only the major insecticides registered for use on field crops in Alberta. Not all insects controlled are listed for each pesticide.

Economic Thresholds: Before making a decision to apply an insecticide, you need to know if the application would be economically justified. In addition to the expected dollar value of your crop, you need to determine whether the insects present will cause a yield loss greater in value than the cost of control. The economic thresholds listed below will assist you in making this decision. Thresholds are given as the number of insects/unit of measure (such as #/plant or #/m^2) or, for insects that are difficult to sample, the amount of damage evident. Chemical controls are generally warranted only when numbers meet or exceed the threshold level. Remember to sample throughout your field to obtain an average infestation level.

OILSEEDS

Insects	Threshold Level
Aphids	Flax - 5 per plant at flowering; Canola - rarely a problem
Army Cutworm	Mustard (seedling) - less than 5 per m^2
Diamondback Moth	20/ft^2 or 180/m^2
Flea Beetles	When 50% of the leaf tissue has been consumed; less if growing and moisture conditions are poor.
Bertha Armyworm	20 larvae per m^2 consume the equivalent of 1.16 bu/ac of canola seed.

CEREALS AND CORN

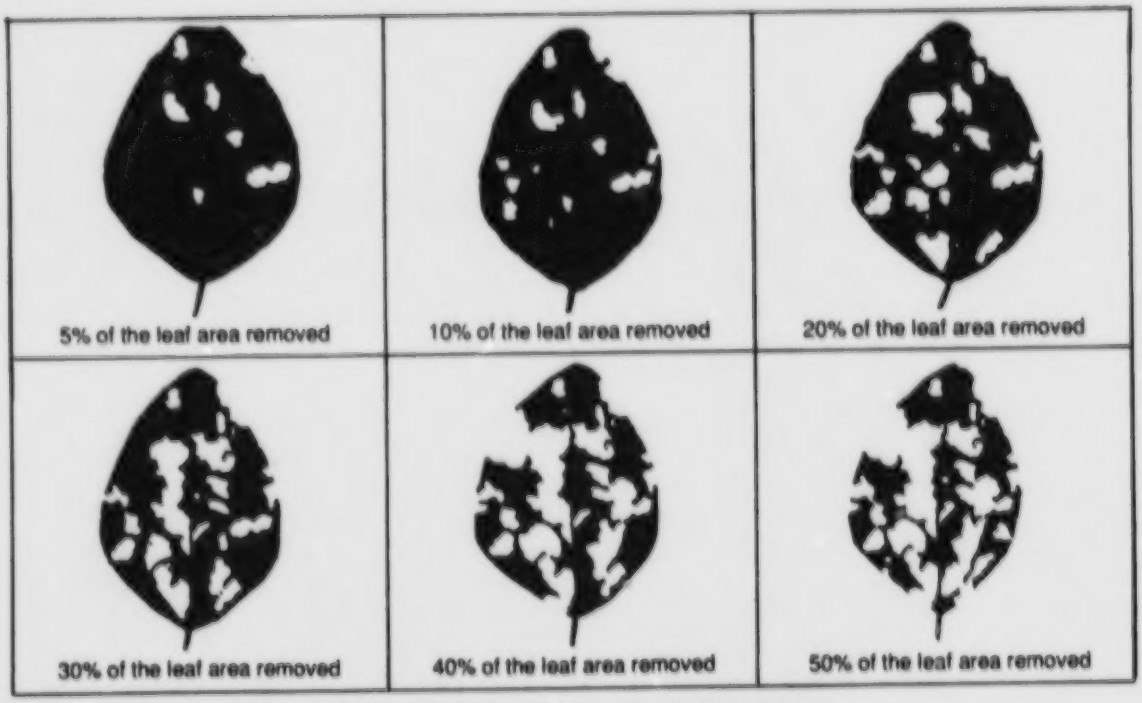
Insect	Threshold Level Number of Aphids/Stem		
	Seedling	Boot	Dough to Maturity
Aphids:			
Greenbug	5-15	10-25	Do not treat
Birdcherry Oat Aphid	20	30	Do not treat
Corn Leaf Aphid	20	30	Do not treat
English Grain Aphid	30	50	Do not treat

	% Plants Showing Damage		
	Seedling	Boot	Dough to Maturity
Russian Wheat Aphid:			
Winter Cereals	15	10	Do not treat
Spring Cereals	10	20	Do not treat

Army Cutworm	10 larvae per m^2
(Pale Western, Red Backed)	3-4 larvae per m^2
Army Cutworm	Plants 10 cm tall: 1-2/30 cm row. Plants 12-15 cm tall: 4/30 cm row.
European Corn Borer	Fresh corn - when egg masses begin to hatch.
Grain Stink Bug	Not available, however, 1 per head of wheat caused losses greater than 30%.

Grasshoppers		No./m^2	
		Field	Roadside
	Control not usually required	0-6	0-12
	May be required	7-12	12-24
	Control required	13+	25+
Wheat Midge	1 per 5 heads of wheat.		
Wheat Stem Sawfly	Resistant varieties are required if 10-15% of the previous crop is cut by sawfly.		

Insect	Threshold Level
Alfalfa Weevil	Alfalfa hay crops - 20-30 larvae/sweep for 12% leaf loss - 50-75 larvae/sweep for 30% leaf loss - 56 larvae/stem at peak of larval population for a return on treatment costs. Alfalfa seed crops. - 20-25 larvae/sweep (90° = straight sweep) - 35-50% of foliage tips show damage.
Grasshoppers	See Cereals section.
Pea Aphid	75-100/plant
Plant Bugs Lygus and Alfalfa Plant (Alfalfa Seed)	5 nymphs/sweep when plants in bud or bloom.
Sweet Clover Weevil	In seedlings. - 1 weevil/5 seedlings in cotyledon stage under slow growing conditions. - 1 weevil/3 seedlings in cotyledon stage under normal growing conditions In newly emerged 2nd-year sweet clover. - 9-12 weevils/plant.


5% of the leaf area removed
10% of the leaf area removed
20% of the leaf area removed
30% of the leaf area removed
40% of the leaf area removed
50% of the leaf area removed

Examples of leaf loss which can be used as a gauge for making determinations.

AMBUSH, POUNCE (permethrin)

ICI Chipman/Chemagro

1. **FORMULATIONS:** Emulsifiable Concentrates: (Ambush); 500 g/L; 6 X 1 L. (Pounce); 384 g/L; 1 L jug.
2. **CROPS:**

barley	flax	peas	sugar beets
canola	lentils	potatoes	sunflowers
corn	oats	rye	wheat

3. **INSECTS CONTROLLED:**

Colorado potato beetle	European corn borer	potato flea beetle	tarnished plant bug
corn earworm	fall armyworm	potato leafhopper	
cutworms (army, pale western, red-backed)			

4. **WHEN USED:** Post-Planting Treatment:
   Air: Apply only once per season.
   Cutworms: Applications should be made under warm, moist conditions in the evening or at night when cutworm activity is highest.
   Corn Borer, Corn Earworm: Spray no later than when first feeding damage is seen on foliage.
5. **HOW TO APPLY:**
   With: Aircraft or Ground equipment.
   Water Volume: Corn: Ambush 130-180 L/ac; Pounce 140-180 L/ac. Potato: sufficient water for thorough coverage of foliage.
   Rate: Higher rate for heavy infestations, when adult insects are present, dense foliage, or (cutworms) when soil is dry.

Crop	Insect	Formulation	Quantity/ac
Barley, canola, corn, flax, lentils, oats, peas, potato, rye, sugar beets, sunflowers, wheat.	Cutworms (army, pale western, red-backed).	Ambush 500 EC	57-120 mL
Corn (sweet)	Corn earworm, European corn borer.	Ambush 500 EC Pounce	80-110 mL 110-150 mL
	Fall armyworm	Ambush 500 EC	57 mL
Potato	Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug.	Ambush 500 EC Pounce	57-80 mL 75-110 mL

6. **APPLICATION TIPS:** Corn: Corn earworm, direct spray to ensure coverage of ears and silk. European corn borer control, consult with provincial personnel for proper timing of spray.
7. **HOW IT WORKS:** Works by contact and as a stomach poison on a wide range of pests. Good residual activity. No systemic or fumigant activity.
8. **GRAZING AND HARVEST RESTRICTIONS:** Cover crop or crop treated with permethrin should not be used as a green feed for animals. Pre-harvest interval (days): corn (1), potatoes (1).
9. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = Ambush 500 EC (3000), Pounce EC (1030). Severe eye irritant. Very toxic to bees and fish.
10. **PRECAUTIONS, FIRST AID:** Wear protective equipment to avoid contact with skin and eyes. Do **not** inhale spray mist. Do not spray when bees are foraging. Spray deposit should be dry before bees commence foraging in treated crops. Keep product away from fire, open flame, electric light bulbs and other sources of heat.
    Caution: Studies have shown that synthetic pyrethroid insecticides can be 1,000 to 10,000 times more toxic to fish than many other insecticides in common use. Careless use of these insecticides can seriously harm sport and commercial fisheries. Entry of these insecticides into small wetlands such as prairie sloughs can affect invertebrate life which is needed for waterfowl reproduction and fish farming. Maintain a minimum 30 metre buffer for ground application and a minimum 100 metre buffer for aerial application. Applications should not be made when wind or rain could favour drift or run-off into lakes, ponds.
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention immediately. Product contains petroleum distillates.
11. **STORAGE:** Heated storage required.

COUNTER (terbufos)

Cyanamid

1. **FORMULATIONS:** Granular: Counter 5-G; 5%; 20 kg bag, 500 kg mini-bulk bag; Counter 15-G; 15%; 25 kg bag.
2. **MARKETING CATEGORY:** Restricted.
3. **REGISTERED MIXES:** 5-G may be mixed with fungicide-treated seed.
4. **CROPS: 5G:** Canola, mustard. **15G:** Corn (field, sweet), sugar beets.
5. **INSECTS CONTROLLED: 5G:** Flea beetles. **15G:** Seedcorn maggot, sugar beet root maggot, wireworms.
6. **WHEN USED:**
   Corn, sugar beets: Do not apply later than at planting time.
   Canola, mustard: Treat seed before planting.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Incorporation:
   Canola, mustard: Carefully blend seed and granules together using a mechanical mixer or stirring with a stick in the drill box.
   Corn: Place in an 18 cm-wide band over the row directly behind the planter shoe in front of the press wheel or place directly in the seed furrow behind the planter shoe.
   Sugar beets: Apply in furrow, 5-8 cm behind the seed drop zone after some soil has covered the seed. Do not place 15-G granules in direct contact with seed.
   Rate: If extreme infestations are anticipated use the higher rate.

Crop	Insect	Formulation	kg/ac
Canola, mustard.	Flea beetles	5-G	2.2-4.5
Corn	Seedcorn maggot, wireworms.	15-G	75 g/100 m row (minimum 75 cm row spacing)
Sugar beet	Sugar beet root maggot, wireworms.	15-G	45 g/100 m row (minimum 50 cm row spacing)

8. **APPLICATION TIPS:** When a seed treatment is also used - mix the seed treatment with seed, then mix granules with treated seed. Cover granules that may be exposed on the ends of the treated rows, turns, and field loading areas. Empty hoppers of equipment while still in the field.
9. **HOW IT WORKS:** Terbufos is a systemic, organophosphorus insecticide with effective initial and residual activity.
10. **EFFECT OF RAINFALL:** The effect of normal rainfall is not appreciable.
11. **MOVEMENT IN SOIL:** Insoluble in water therefore movement is not appreciable.
12. **GRAZING AND HARVEST RESTRICTIONS:** Treated sugar beet tops and beet pulp may be fed to livestock after harvest.
13. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (1.6). Highly toxic to fish, birds, and other wildlife.
14. **PRECAUTIONS, FIRST AID:** Rapidly absorbed through skin. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning. While transferring from package to equipment, wear a clean cap and gloves (rubber or cotton). Cotton gloves must be laundered or discarded after each day's use. Clothes and rubber gloves should be washed with soap and water after each use. Do not wear the same gloves for other work. Wash thoroughly with soap and water before eating, drinking or smoking. Bathe at the end of the work day, and change outer clothing. Counter 15-G, **do not breathe dust** while emptying bags into equipment, pour downwind and allow as little free fall as possible. Do not pour at face level and do not allow dust to reach the breathing zone. Sweep up granules and place in a tightly closed labelled container. Contact Cyanamid Canada to obtain details on how to detoxify product. Keep all unprotected persons out of the operating areas. **Keep out of reach of children and animals.**
    Symptoms of poisoning: Weakness, headache, tightness of chest, blurred vision, non-reactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea or abdominal cramps.
    Caution: Seed treated with this product is extremely hazardous to livestock. Each year livestock are poisoned due to improper storage, improper drill clean-out, or improper disposal of treated seed. Never store this insecticide or treated seed in any area accessible to livestock. Clean seed drills away from areas accessible to livestock and clean up all treated seed spills immediately. Excess treated seed should be disposed of by double planting.
    Highly Flammable: Fine airborn dust can cause an explosion.
    First Aid: Call a Physician at once in all cases of suspected poisoning. In emergency endangering life or property, call collect, day or night, 1-613-996-6666. **Antidote is atropine.** Consult your physician about obtaining a supply of 0.65 milligram tablets for emergency use. If symptoms of poisoning occur, do not wait for a physician but take 2 tablets at once. Do not take atropine unless symptoms of poisoning have occurred. Anyone who has been sick enough to have taken atropine must be seen by a physician as soon as possible. **If inhaled** remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. **If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention.
15. **STORAGE:** Store open bags in labelled sealed drums, or heavy plastic bags.
16. **DECONTAMINATION:** All mixing equipment must be rinsed with the decontamination solution.

Decontamination Solution: Wash the surface with the decontamination solution prepared by mixing 9 L of water with 1 L of commercial bleach and 0.5 L of rubbing alcohol. Rinse with clean water. If spills occur on floor areas, use a sweeping compound to clean up. Decontaminate the waste with decontamination solution. Wash floor with decontamination solution and rinse well with clean water. Clean up solution and rinse water with absorbent materials such as sawdust, sweeping compound, rags, etc. Dispose of the contaminated absorbent material in accordance with provincial requirements.

CYGON, LAGON, HOPPER STOPPER, DIMETHOATE 480(dimethoate)

WARNING POISON

Cyanamid/United Agri Products/Peacock Industries

1. **FORMULATIONS:** Emulsifiable Concentrate; 480 g/L; Cygon (480E, 4-E); Cygon Hopper-Kill; 20 L can. Lagon 480 E 1 L, 4 L, 10 L, 20 L cans. Bran Bait; 5.2%; Cygon Hopper Stopper; 20 kg box (See Bait directions below). Dimethoate 480; 10 L container.
2. **CROPS:**

alfalfa	clovers	pastures	safflowers
barley	corn	peas	sugar beets
beans	flax	potatoes	sunflowers
canary seed	oats	rye	wheat
canola			

3. **INSECTS CONTROLLED:**

aphids	leafhoppers	plant bugs	tarnished plant bugs
grasshoppers	lygus bugs	stink bug	thrips
	mites	sweet clover weevil	

4. **INSECTS SUPPRESSED:** Alfalfa weevil larvae.
5. **WHEN USED:** Apply when economic damage is apparent. Repeat if necessary.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Water Volume: 18 L/ac for good coverage. Potatoes: 80 L/ac minimum; Safflowers: 9 L/ac.
Rate: Lower rate for young insects, minor infestations or sparse foliage; higher rate for adult insects (winged grasshoppers and beetles), severe infestations or dense foliage.

Crop	Insect	mL/ac	Crop	Insect	mL/ac
Alfalfa	Aphids, young grasshoppers.	285-405	Beans	Aphids, leafhoppers, leafminers, lygus bugs, mites, tarnished plant bugs.	225-405
	Leafhoppers, lygus bugs, plant bugs, alfalfa weevil larvae suppression, pea aphid.	505			
			Canary Seed	Aphids	202
	Adult or winged grasshoppers.	405	Canola	Aphids, grasshoppers.	340-360
	Sweet clover weevil	344-405			
Barley, oats, rye, wheat.	Grasshoppers, aphids, stink bug.	175-400	Clover (sweet)	Sweet clover weevil	340-400
			Peas	Aphids	110-170
Barley, oats, rye, wheat.	Thrips	400	Potato	Aphids, leafhoppers.	225-450
Barley, oats, wheat	Russian wheat aphid suppression	405	Safflowers	Grasshoppers	405

Note: Check each specific label to insure the insect is included on that label.

7. **APPLICATION TIPS:** Not suitable for application in oil. Do not use when bees are foraging. When using foliar sprays, do not apply during heat of the day or when temperatures are excessively high.
8. **HOW IT WORKS:** Dimethoate is a broad-spectrum, systemic and contact, organophosphate insecticide and acaricide.
9. **GRAZING AND HARVEST RESTRICTIONS:** Remove cattle prior to spraying. Pre-harvest and pre-grazing intervals depend on rate used. Do not harvest or graze within (days): 170-220 mL/ac - (2); 340-360 mL/ac - canola (7), grains (21); 360-450 mL/ac - (28). Do not harvest potatoes within 7 days. Russian wheat aphid: do not graze within 7 days; do not harvest within 21 days.
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (500-680), technical (180-336). Highly toxic to birds, bees, and other animals.
11. **PRECAUTIONS, FIRST AID:**
Protective Equipment: Can be absorbed through the skin. Wear a respirator, goggles, rubber gloves, rubber boots, and coveralls when handling concentrate to avoid contact with skin and eyes. Do not inhale spray mist. Use in adequately ventilated area. Do not use or spill or store near heat or open flame. Do not use when bees are foraging.
Symptoms of poisoning: Anorexia, nausea, vomiting, pinpoint pupils, excessive salivation, muscle twitching, convulsions or coma.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.

Notes to Physician: It is a cholinesterase inhibitor and an organophosphate insecticide. Atropinize slowly to avoid cardiac arrest. Avoid aspiration and respiratory depressants.

12. **STORAGE:** Store between 5°C and 30°C, away from feed and food.
13. **DECONTAMINATION:**
Spills: Scrub contaminated area immediately with a strong laundry soap solution or use household lye - detergents are not satisfactory. Repeated scrubbings are necessary on plain wood surfaces.

HOPPER STOPPER BRAN BAIT
Application: Applied dry, broadcast evenly to control grasshoppers. Use no more than once a week for heavy infestations; no more than once every 2 weeks for moderate to low infestations. Do not contaminate bodies of water, food or feed.
Rate: 0.8-1.2 kg/ac. Non-toxic to pollinators if applied as directed.
Beef Cattle: Do not have to be removed during treatment.
Dairy Cattle: Do not graze or harvest forage for 48 hours.
Grain Crops: Do not harvest for 21 days after treatment.

CYMBUSH, RIPCORD (cypermethrin)

ICI Chipman/Ciba-Geigy

WARNING POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; Cymbush; 250 g/L; 1 L jugs; Ripcord 400 EC; 400 g/L; 6 X 1 L pack.
2. **REGISTERED MIXES:** None.
3. **CROPS:**
Cymbush: Canola, corn, mustard, potatoes, sunflowers.
Ripcord: Barley, corn, canola, headlands, potatoes, rapeseed, roadsides, summerfallow, sunflower, wheat.
4. **INSECTS CONTROLLED:**
Reorder

bertha armyworm	European corn borer	strawberry weevil	cutworms
Colorado potato beetle	potato flea beetle	sunflower beetle	flea beetles
corn earworm	potato leafhopper.	tarnished plant bug	grasshoppers
crucifer flea beetle		tuber flea beetle	

5. **WHEN USED:**
Ground: Do not apply more than 3 times per season.
Air: Canola, sunflowers: once per season. Corn, potatoes: up to 2 times per season.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Water Volume: Corn: 130-180 L/ac. Potatoes, rapeseed (canola), sunflower: 40-50 L/ac.
Pressure: 250-300 kPa.
Rate:

Crop	Insect	Cymbush mL/ac	Ripcord mL/ac
Barley, canola, headlands, roadsides, summerfallow, wheat.	Grasshoppers	-	20-28
Corn	European corn borer	113	70
Potatoes	Colorado potato beetle, potato flea beetle, potato leafhopper, tuber flea beetle.	55	25-50
	Tarnished plant bug	80	50
	Variegated (climbing) cutworm	-	70
Canola, mustard	Crucifer flea beetle	55	-
(*canola only)	Flea beetles*	-	20
	Bertha armyworm	80-113	28 (ground)* 35 (air)*
Seedling potatoes, corn, barley and wheat	Cutworms (army, darksided, pale western, redbacked)	-	70
Strawberry	Strawberry weevil		70
	Tarnished plant bug		100
Sunflowers	Sunflower beetle	40	28

7. **APPLICATION TIPS:** 15 m buffer zone from water must be maintained when applying by ground. 100 m buffer zone from water must be maintained when spraying by air.
Corn: Direct spray to ensure coverage of ears and silk. Consult your local provincial personnel for proper timing of spray.
Grasshoppers: Avoid application when temperatures are above 25°C. Bees: spray mist must be dried before bees commence foraging in treated crop.
Cutworms: Spray under warm, moist conditions and do not disturb the soil surface for at least 5 days.

8. **HOW IT WORKS:** By contact and stomach action. Good residual activity. No systemic or fumigant activity.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval (days); barley (60); wheat (30); canola (30), corn (5), mustard (30), potatoes (7), sunflowers (70). Cover crop or crop treated with cypermethrin must not be used as a green feed for animals.
10. **TOXICITY:** Low-moderate mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = cypermethrin (3,200), Cymbush (760); Ripcord (542). Very toxic to bees and fish.
11. **PRECAUTIONS, FIRST AID:** Harmful or fatal if swallowed or absorbed through skin. A small amount of vomited liquid inhaled can be fatal. Avoid contact with eyes and clothing. Spray mist must be dried before bees commence foraging in treated crop.
    Caution: Studies have shown that synthetic pyrethroid insecticides can be 1,000 to 10,000 times more toxic to fish than many other insecticides in common use. Careless use of these insecticides can seriously harm sport and commercial fisheries. Entry of these insecticides into small wetlands such as prairie sloughs can affect invertebrate life which is needed for waterfowl reproduction and fish farming. Maintain a minimum 30 metre buffer for ground application and a minimum 100 metre buffer for aerial application. Applications should not be made when wind or rain could favour drift or run-off into lakes, ponds. May explode if heated.
    First Aid: If swallowed seek medical attention immediately. This product contains petroleum distillates.
    Notes to Physician: It is a CNS depressant. Steroids can be used to reduce inflammation. Avoid aspiration.
12. **STORAGE:** Store in heated chemical shed.

DECIS (deltamethrin)

Hoechst

DANGER POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; Decis 5 EC; 50 g/L; 2.5 L jugs. Flowable; Decis 5 F; 50 g/L; 3 L jugs.
2. **REGISTERED MIXES:** Hoe-Grass II, Hoe-Grass 284.
   Mix Restrictions: Do not mix with any other chemicals, additives, or fertilizers.
3. **CROPS:**
   Decis 5 EC: Alfalfa (for seed production only), barley, canola, field corn, flax, lentils, mustard, oats, pastures (or rangeland), potatoes, sunflowers, wheat (all types).
   Decis 5 F: Barley, canola, flax, lentils, mustard, oats, wheat (all types), pastures (or rangeland).
4. **INSECTS CONTROLLED:**
   Decis 5 F: Only flea beetles and grasshoppers.
   Decis 5 EC:

alfalfa weevil	cutworms	grasshoppers	potato flea beetle
bertha armyworm	diamondback moth	leafhoppers	sunflower beetle
clover cutworm	European corn borer	lygus bugs	tarnished plant bug
Colorado potato beetle	flea beetles		

5. **WHEN USED:** When economic damage is apparent. Grasshoppers: Best results on young (non-flying) grasshoppers (2-4 nymphal stage). Sunflower beetle: When crop is in cotyledon to 2 leaf stage. European corn borer: Apply when egg masses begin to hatch. Consult your district agriculturist for appropriate spray schedule.
   Number of applications: Maximum of 1 per year on bertha armyworm, cutworms, diamondback moth, flea beetles, potato flea beetle, sunflower beetle. Other pests, maximum of 3 per year. Only 1 aerial application per year except for grasshoppers and potato pests which can be sprayed twice per year by air.
6. **HOW TO APPLY:**
   With: Aircraft: Decis 5 EC and 5 F; Barley, canola, flax, lentils, mustard, oats, wheat. Decis 5 EC only: potatoes, sunflowers. Ground equipment: All crops.
   Water Volume: Air: Decis 5 EC and 5 F: 4.4-8.8 L/ac. Ground: Decis 5 EC: Alfalfa 40-120 L/ac; Field corn 100 L/ac minimum. Potatoes 80-200 L/ac. Decis 5 EC and 5 F: Canola, mustard 40 L/ac; Cereals 40-80 L/ac;
   Pressure: Air: 200 kPa minimum. Ground: 275 kPa.
   Nozzles: Aerial droplet size 150-250 micron recommended. Flat fan only.
   Decis 5 F: 50 mesh or larger line strainers and screens.
   Rate: Higher rate for severe infestations on dense foliage, or when adult insects are present.

Crop	Insect	Decis 5 F (mL/ac)
Barley, flax, lentils, oats, pasture (or rangeland), wheat	Grasshoppers	32-50
Canola, mustard	Flea beetles	40-60

Crop	Insect	Decis 5 EC* (mL/ac)
Alfalfa (seed production only)	Alfalfa weevil, lygus bugs	80-100
Barley, flax, lentils, oats, pasture (or rangeland), wheat	Cutworms	80
	Grasshoppers	40-60
Canola, mustard	Bertha armyworm, clover cutworm, diamondback moth, flea beetles	40-60
Field corn	European corn borer	100-120
Potato	Colorado potato beetle, leafhoppers, potato flea beetle, tarnished plant bug	40-60
Sunflowers	Sunflower beetle	40

*Decis 5 EC on high organic (muck) soils: apply 80 mL/ac. Apply only once during each crop year, prior to August 1.

7. **APPLICATION TIPS:**
Air application: Leave 100 m border between edge of treated fields and environmentally sensitive areas (e.g. wetlands, sloughs, rivers, houses, farm buildings). Best control is achieved by morning or evening applications. Do not spray under a strong temperature inversion, or when temperature exceeds 25°C. With severe flea beetle and grasshopper infestations, spray fence rows and a 15 m strip into adjacent summerfallow and cropped fields. For grasshoppers use high EC rate only.
8. **HOW IT WORKS:** Deltamethrin is a non-systemic, synthetic pyrethroid which works by contact and ingestion.
9. **EXPECTED RESULTS:** Speed of kill depends on target insect and environmental conditions. Death may occur as rapidly as 2 hours.
10. **EFFECTS OF RAINFALL:** Do not apply within 1 hour of rain.
11. **MOVEMENT IN SOIL:** Becomes fixed on soil colloidal particles and broken down by micro-organisms.
12. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval (days): canola (8), mustard (14); cereals, flax (40); potatoes (3); sunflowers (70). Do not allow rangeland beef cattle to graze treated fields within one day of application.
Warning: Dairy cattle must not be fed treated silage or grazed on Decis treated crops. Foraging is only permitted for rangeland beef cattle. Do not feed harvested alfalfa forage within 90 days of harvest.
13. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (395). Severe eye and skin irritant. Very toxic to aquatic organisms and fish. Toxic to bees and other beneficial insects.
Caution: Studies have shown that synthetic pyrethroid insecticides can be 1,000 to 10,000 times more toxic to fish than many other insecticides in common use. Careless use of these insecticides can seriously harm sport and commercial fisheries. Entry of these insecticides into small wetlands such as prairie sloughs can affect invertebrate life which is needed for waterfowl reproduction and fish farming. Maintain a minimum 30 metre buffer for ground application and a minimum 100 metre buffer for aerial application. Applications should not be made when wind or rain could favour drift or run-off into lakes, ponds.
14. **PRECAUTIONS, FIRST AID:** Wear goggles or face shield and protective clothing to protect skin and eyes. Do not inhale. Keep away from fire, open flame and other sources of heat. Do not apply when bees are foraging.
Symptoms of poisoning: Neurological dysfunction, such as convulsion with severe poisoning.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Treat irritated skin area with Nivea cream. **If swallowed** seek medical attention.
15. **STORAGE:** Do not store below freezing. Do not store near feed or food. Keep away from heat, sparks and open flames.

DIAZINON (diazinon)

United Agri Products/Sanex

1. **FORMULATIONS:** Wettable Powder (WP); Diazinon 50W; 50%; 10 X 2.0 kg pack. Basudin 50W; 50%; 10 X 2 kg pack. Emulsifiable Concentrate (EC); Diazinon 500; 500 g/L; 4 X 4 L pack. Diazinon 50 EC; 500 g/L.
2. **REGISTERED MIXES:** When using WP as a seed treatment for corn, mix with a fungicide (75% captan or 75% thiram).
3. **CROPS:** Beans (all types), corn, hay, non-crop areas, pasture, potatoes, rangeland.
4. **INSECTS CONTROLLED:**

aphids	grasshoppers	leafminers
Colorado potato beetle	leafhoppers	root maggots
flea beetles		

5. **WHEN USED:** Treat seed within 3 months of planting. Foliar application: repeat if necessary.
6. **HOW TO APPLY:**
With: Ground equipment.
Water Volume: Use sufficient water to obtain thorough coverage.

Rate:

Crop	Insect	Formulation	Quantity
Seed Treatment - Corn, beans (all types including lima, snap, field, soybeans).*	Root maggots	WP	17 g/bushel of grain
Potatoes	Aphids, Colorado potato beetle, flea beetles, leafhoppers, leafminers.	WP	445 g/ac
		EC	445 mL/ac
Foliar Treatment - Hay, non-crop areas, pasture, rangeland.	Grasshoppers	WP	445 g/ac
		EC	445 mL/ac

***Note:** If seed has not been treated with a fungicide, use 75% captan or 75% thiram at the rate given on fungicide label, otherwise injury to seed may result.

7. **APPLICATION TIPS:** Seed treatment (corn, beans): treat seed within 3 months of planting. Add correct amount of WP to 285 mL of water for each bushel to be treated and thoroughly mix seed. Dry seed before bagging or planting. Do not use more than recommended rate or injury and reduced stand may occur. Seed treatment (potato pieces): immerse in solution.
   Foliar Treatment: Do not apply during bloom to avoid injuring pollinating insects.
8. **HOW IT WORKS:** A non-systemic, organophosphate insecticide which works by contact and ingestion. Deteriorates rapidly in solution and in containers once opened.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval for potatoes 14 days. Do not cut hay for 21 days after treatment. Dairy cattle, beef cattle, and sheep may be grazed or fed green forage immediately following application.
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = diazinon (300-850), Basudin (1,400). Toxic to bees, fish, and other animals.
11. **PRECAUTIONS, FIRST AID:** Highly flammable. Wear protective gear, including rubber gloves to avoid contact with skin or eyes - do not inhale spray mist. Label treated seed, **"Do not use for food or feed. This seed has been treated with diazinon. Poisonous to man and animals." Keep out of reach of children.**
    Symptoms of poisoning: Headaches, giddiness, blurred vision, nervousness, weakness, nausea, cramps, diarrhea, discomfort in the chest, sweating, pinpoint pupils, tearing, salivation, vomiting, uncontrolled muscle twitching, convulsions, or coma.
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
    Notes to Physician: It is a cholinesterase inhibitor. Do not give respiratory depressants. Avoid aspiration. Atropinize slowly to avoid cardiac arrests.
12. **STORAGE:** Do not store or use EC near heat or open flame. Flash point 27°C.
13. **DECONTAMINATION:**
    Spills on concrete floors: Surround and cover spill with a granular carrier such as Attaclay (cat litter). Allow carrier to absorb the liquid, then shovel into a container for disposal. Wash the floor with a weak lye solution to remove any trace of pesticide.
    Spills on wooden floors: Use same procedure as for concrete floor but repeat washing until odor disappears. Decontaminate equipment by thoroughly rinsing with water.

DIBROM (naled)

Chevron

1. **FORMULATIONS:** Emulsifiable concentrate, 864 g/L, 3.78 L jug.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Alfalfa, beans (dry or field), clover, pasture (or rangeland), potato, sugar beets, vetch.
4. **INSECTS CONTROLLED:** Aphids, Colorado potato beetle, flea beetles, grasshoppers, leafhoppers, loopers, Lygus bugs, red spider mites.
5. **WHEN USED:** Repeat as necessary. Do not apply when temperature is over 32°C.
6. **HOW TO APPLY:**
   With: Aircraft or ground equipment.
   Water Volume: Air: 30 - 40 L/ac; Ground: 30 - 160 L/ac.
   Rates:

		mL/ac
Alfalfa, clover, vetch	Aphids, loopers, leafhoppers, lygus bugs	445 - 890
Beans (dry or field)	Alfalfa looper, aphids, red spider mites	445 - 890
Pasture (or rangeland)	Grasshoppers: nymphs	225 - 345
	adults	285 - 405
Potato	Colorado potato beetle, flea beetles, leafhoppers	445
Sugar beets	Leafhoppers, red spider mites	890

7. **APPLICATION TIPS:** Apply in sufficient water for thorough coverage.

8. **HOW IT WORKS:** Naled is an organophosphate insecticide and acaricide which works by contact action.
9. **GRAZING AND HARVEST RESTRICTIONS:** Do not apply within 4 days of harvest or grazing unless otherwise specified on the label: Animals may be present on pasture or rangeland during treatment for grasshoppers.
10. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = 430. Acute dermal LD_{50} rats (mg/kg) = 1100. Concentrate may cause skin damage. Very toxic to bees. Toxic to fish, aquatic invertebrates, birds and other wildlife.
11. **PRECAUTIONS, FIRST AID:** Do not get in eyes, on skin or clothing. Do not inhale vapour or spray mist. Wear goggles or face shield, pesticide approved respirator and impervious protective clothing when handling. Very toxic to bees for 1 - 1.5 days following treatment. Incontinence, unconsciousness and convulsions indicate severe poisoning.
First Aid: If in eyes or on skin, use standard first aid measures (see page xxiii). Get medical attention for the eyes. **If swallowed: immediately call a doctor.**
Note to Physician: Atropine sulphate is antidotal. 2-PAM (PROTOPAM) is also antidotal and may be used in conjunction with atropine but should not be used alone.
12. **STORAGE:** Do not store near heat or open flame. Do not store below -10°C.

DYFONATE II 10G (fonofos)

ICI Chipman

DANGER POISON

1. **FORMULATION:** Granular, 10%, 20 kg bag.
2. **CROPS:** Corn (field and sweet), Potatoes.
3. **INSECTS CONTROLLED:** Seedcorn maggot, wireworms, tuber flea beetle.
4. **WHEN USED:** Do not apply later than planting time.
5. **HOW TO APPLY:**
With: Ground equipment.
Corn: Placed in a 15-20 cm band over the row, incorporate with the top 1 to 3 cm of soil by making application ahead of press wheels, or by use of special covering devices, or by dragging a short length of chain behind the press wheels. (Do not place Dyfonate II 10G in direct contact with the seed). Dyfonate II 10G may also be broadcast prior to seeding and incorporated 5-7 cm into the soil.
Potatoes: Placed into the fertilizer furrows by regulated flow. Dyfonate II may also be broadcast and incorporated into the soil by discing or rototilling to a depth of 15 cm prior to planting.
Rate: If severe infestations are expected use the higher rate.
Crop:
Corn
a) Banded

Row width (cm)	75	90	96-102
Insect		**Rate (kg/ac)**	
Seedcorn maggot	4.5 - 5.8	3.8 - 4.9	3.2 - 4.5
Wireworm	5.8	4.9	4.5

b) Broadcast: for control of wireworm apply 17.8 kg/ac.
Potatoes - Banded: for control of wireworms at 9 kg/ac. Broadcast for control of wireworm and first generation tuber flea beetle at 22.7 kg/ac. Use only on irrigated soil.

6. **HOW IT WORKS:** Fonofos is a organophosphorus insecticide with effective initial and residual activity.
7. **EFFECT OF RAINFALL:** The effect of normal rainfall is not appreciable.
8. **MOVEMENT IN THE SOIL:** Insoluble in water, therefore movement is not appreciable.
9. **GRAZING AND HARVEST RESTRICTIONS:** None.
10. **TOXICITY:** High acute mammal toxicity. Acute oral LD50 rat = 103 - 230 mg/kg. This product is toxic to fish, birds and other wildlife.
11. **PRECAUTIONS AND FIRST AID: If swallowed:** Immediately dilute the swallowed material by giving large quantities of water and induce vomiting. Give liquids until vomit is clear. Never give anything by mouth to an unconscious or convulsing person. Call a physician or the nearest poison control centre immediately. **If inhaled**: Remove to fresh air. If breathing has ceased, clear the victim's airway and start artificial respiration, preferably by medical means. Call a physician immediately. **If in eyes:** Immediately flush eyes with large amounts of running water for at least 15 minutes. Get medical attention immediately. Continue flushing eyes for an additional 15 minutes if a physician is not available. **If on skin:** Remove contaminated clothing and immediately wash skin thoroughly for 15 minutes with soap and water. Avoid abrading the skin. Get medical attention immediately.

Symptoms of poisoning: Include weakness, tightness of chest, blurred vision, nonreactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea and abdominal cramps.
First aid: Call a physician immediately if a known exposure occurs, do not wait for symptoms to develop. Immediately initiate the recommended procedures above. Important - be sure to advise the physician that this compound is a cholinesterase inhibitor, and to follow the physician's advice. **Atropine by injection is antidotal.**

11. **STORAGE:** Do not transport or store with any food or feed intended for human or animal consumption. Not for use or storage in or around the home. Store in a cool, dry place. Protect from excessive heat. Keep this product in original container.

DYLOX (trichlorfon)

Chemagro

DANGER POISON

1. **FORMULATIONS:** Soluble Powder; 80% by weight; 12 X 2.3 kg pack. Solution; 420 g/L; 20 L container.
2. **REGISTERED MIXES:**
Mixing Instructions: Powder: to dissolve, pour the required amount into full amount of water, then agitate. Use immediately after mixing.
3. **CROPS:** Alfalfa, barley, beans (dry, lima, snap), canola, corn (field, popcorn, sweet), flax, oats, sugar beets, wheat.
4. **INSECTS CONTROLLED:**

alfalfa caterpillar	diamondback moth	stink bugs
armyworms (beet, bertha, common, true, western yellow-striped)	dipterous leaf miner	tarnished plant bug
cutworms, variegated	imported cabbageworm	webworm (alfalfa, beet)
	lygus bugs	

5. **WHEN USED:**
Alfalfa: 1 application per cutting.
Barley, flax, oats, wheat: Repeat as necessary prior to flowering or head emergence but not after flowering to flax; 1 additional application may be made to barley, oats, and wheat after heads emerge from sheath.
Beans: Repeat as necessary. Do not apply to lima beans after pod set.
Canola, sugar beets: Repeat as necessary.
Corn (field, sweet): Maximum of 3 per season with either formulation. Early applications when plants are 8-30 cm tall.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Rate: Low rate for immature insects, light infestations or sparse foliage.
Exception: Webworm control on sugar beets, use higher rate with low volume air application, low rate with row crop sprayers.

Crop	Insect	Powder g/ac	Liquid L/ac
Alfalfa	Alfalfa caterpillar	210-285	0.4-0.6
	Alfalfa webworm	140-610	0.28-1.1
	Beet armyworm, variegated cutworm.	285-610	0.6-1.1
	Lygus bugs, stink bugs, tarnished plant bug.	610	1.1
Barley, flax, oats, wheat.	Armyworms (common, true, western yellow-striped).	285	0.6
	Beet webworm, variegated cutworm.	285-610	0.6-1.1
	Bertha armworm	610	1.1
Beans	Armyworms, imported cabbageworm, dipterous leaf miner, lygus bugs, stink bug, variegated cutworm.	610-910	1.1-1.6
Canola	Beet webworm	285	0.6
	Diamondback moth	610	1.1
Corn (field, sweet)	Armyworms, cutworms.	285-610	0.6-1.1
Sugar beet	Beet webworm	140-285	0.3-0.6
	Dipterous leaf miners, variegated cutworm.	285-610	0.6-1.1
	Alfalfa webworm, beet armyworm.	610-910	1.1-1.6

7. **APPLICATION TIPS:** Powder dissolves readily in water and is suitable for use in all power-operated ground sprayers and aircraft sprayers. Soluble powders should be used in sprayers equipped with 0.3 mm or larger screens. If 0.15 mm screens are used, some screen clogging may occur. Trichlorfon is a selective insecticide: beneficial insect species are less affected. This selective advantage is lost when product is used in conjunction with or alternated with non-selective pesticides.
Corn: For early applications to control armyworms and cutworms, spray when plants are 8-30 cm high; direct the spray to the lower portions of the plant. Later applications may be made as full coverage. Do not apply to or allow spray drift onto varieties of sorghum which are sensitive to phosphates.
8. **HOW IT WORKS:** Trichlorfon is an organophosphate insecticide which works by contact and ingestion.

9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest or pre-grazing interval (days): alfalfa (14); barley, flax, oats, wheat (21); beans (14); canola (21); corn (0); sugar beets (14). Sugar beets - do not feed tops harvested within 28 days of treatment.
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (144), 80% Powder (470), Liquid solution (950).
11. **PRECAUTIONS, FIRST AID:** Can cause eye damage and be absorbed through the skin. Wear standard protective clothing (see page xx) to protect skin and eyes. Do not inhale spray mist. Intake can cause respiratory failure. **Keep out of reach of children.**
    Symptoms of poisoning: Tightness in the chest, sweating, contracted pupils, stomach pains, vomiting, and diarrhea. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
    For Physician: Antidote is atropine sulphate administered in large therapeutic doses repeated as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine. Do **not** give morphine.
12. **STORAGE:** Store liquids above 0°C and away from excessive heat and open flame. Store in an area specially designated for pesticides. Do not store near any material intended for use or consumption by humans or animals.

FURADAN (carbofuran)

Chemagro

DANGER POISON

1. **FORMULATIONS:** Granular; Furadan 10G, CR-10; 10%; 20 kg bag; Furadan 5G, 5%; 20 kg bag. Flowable; Furadan 480; 480 g/L; 4 X 4 L pack, 18.9 L pail.
2. **REGISTERED MIXES:** Furadan 480: all formulations of 2,4-D and MCPA (use only on crops listed on both labels). Compatible with most fungicides. Do not mix with Bordeaux mixture or hydrated lime.
3. **CROPS:**

alfalfa	corn (field,	mustard	roadsides
barley	silage, sweet)	oats	sugar beets
canola	flax	pastures	
clover (sweet)	headlands	potatoes	

4. **INSECTS CONTROLLED:**

alfalfa weevil	European corn borer	leafhoppers	sugar beet root maggot
aphids	flea beetles	potato flea beetle	tarnished plant bug
Colorado potato beetle	grasshoppers	potato leafhopper	

5. **WHEN USED:**
   Alfalfa weevil: When 25% of the alfalfa tips show feeding damage. Maximum of 1 application per season.
   Aphids, Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug: Repeat as necessary.
   European corn borer: No later than when first feeding is seen on foliage. Follow provincial recommendations from the moth flight monitoring program.
   Flea beetles: (Flowable) Apply when 50% of leaf tissue has been consumed; sooner if growing conditions are poor. Maximum 2 applications per season.
   Grasshoppers: Control may be indicated for cereals when 7 or more /m^2 present. Maximum applications per season: canola, flax, mustard (1); cereals, headlands, legumes, pastures, roadsides (2); corn (4).
   Sugar beet root maggots: One application/season, not within 120 days of harvest. Apply at the very early stage of root maggot activity, usually the first week in June.
6. **HOW TO APPLY:**
   (A) Granular
   With:
   CR-10: Hoe or press drill.
   10G: Insecticide application attachment.
   Incorporation:
   Canola, mustard: For seed drill application only; not valid for application with discer seeders. Efficacy can be reduced by harrowing after seeding. Mix granules and seed thoroughly. Check for accurate calibration.
   Potatoes: Apply as a 10 cm wide band into seed furrow or drill into the soil 10 cm on each side of row and 5 cm below seed.
   Sugarbeets: Apply directly into seed furrow at same depth as seed or slightly above seed. Do not mix seed, fertilizer and insecticide in same hopper.
   Rate: Higher rate for severe infestation.

Crop	Insect	Formulation	kg/ac
Canola, mustard.	Flea beetles	CR-10	1.1
		5G	1.8-2.2
Potatoes	Colorado potato beetle, potato flea beetle, leafhoppers.	10G	13.6 (using 90 cm row spacing or 300g/100 m of row)
Sugar beet	Sugar beet root maggot	10G	3.4

(B) Flowable

With: Aircraft or Ground equipment.

Water Volume: Air: 8 L/ac minimum. Ground: 40 L/ac minimum. Potatoes: 325-405 L/ac. Use sufficient water for thorough coverage.

Sugar beets: 80 L/ac as a drench over the row followed by a light sprinkler irrigation to incorporate Furadan into the soil.

Pressure: Potatoes: 275 kPa minimum.

Rate: Higher rate for severe infestations.

Crop	Insect	mL/ac
Alfalfa	Alfalfa weevil	225
Alfalfa; barley; canola; clover (sweet); corn (field, sweet); flax; headlands; mustard; oats; pasture; roadsides; wheat.	Grasshoppers	110
Canola, mustard.	Flea beetles	60-110
	Red turnip beetle	110
Corn (field, silage, sweet)	European corn borer	445
Potatoes	Aphids, potato flea beetle, potato leafhopper, tarnished plant bug.	445
Potatoes	Colorado potato beetle	225
Sugar beets	Sugar beet root maggot	950

7. **APPLICATION TIPS:** Check the label for calibration of various types of granular applicators. If seed decay, seedling blight or damping-off diseases are a problem, treat seed with a recommended fungicide. Canola and mustard may also require a foliar treatment after seeding with granules. Check fields shortly after emergence. Do not use on fields subject to flooding. Boom sprayers: equip with hydraulic or mechanical agitation and 50 mesh screens; remove any felt filters.
8. **HOW IT WORKS:** Carbofuran is a broad-spectrum, systemic, carbamate insecticide, acaricide and nematicide.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest or pre-grazing interval (days): Alfalfa weevils (7), grasshoppers (1); barley, flax, mustard, oats, wheat (21); canola (60); clover (sweet)(28); corn (7); headlands, pasture, roadsides (1); potatoes (7). Sugar beet tops and pulp may be fed to livestock without causing residues in milk or meat.
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (11), Flowable 480 (19), CR10 and 10G (131). Highly toxic to bees, waterfowl, birds, fish, and other wildlife.
11. **PRECAUTIONS, FIRST AID:** Wear coveralls, goggles, and respirator (e.g. American Optical 6058 or Willson Agritox respirator with appropriate filter or cartridge) at all times. Do not breathe spray mist or dust. **Never** handle product with bare hands. Use rubber or neoprene gloves, do **not** use leather gloves. When handling toxic materials do not carry cigarettes, or edibles on your person and do not smoke, eat, chew gum, or tobacco while conducting mixing or loading operations. Change clothes each day. Wash clothes in detergent, bleach and hot water. Take a bath at the end of each day.
Symptoms of poisoning: Blurred vision, nausea, excessive perspiration, weakness, headache, light-headedness, constriction of pupils, cramps, salivation and vomiting. Carbofuran causes reversible cholinesterase inhibition.
Caution: Seed treated with this product is extremely hazardous to livestock. Each year livestock are poisoned due to improper storage, improper drill clean-out, or improper disposal of treated seed. Never store this insecticide or treated seed in any area accessible to livestock. Clean seed drills away from areas accessible to livestock and clean up all treated seed spills immediately. Excess treated seed should be disposed of by double planting.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
Notes to Physician: It is a cholinesterase inhibitor. Atropinize slowly to avoid cardiac arrest. Don't use oximes; eg. 2 PAM.
Special precautions for burrowing owl: The use of Furadan 480F may pose a hazard to the Burrowing Owl, a threatened species. The Burrowing Owl is known to nest in abandoned ground squirrel and badger burrows in specific areas of the southern Prairies. These burrows commonly are found in non-cultivated land such as roadsides, ditchbanks, pastures and rangeland. Areas heavily grazed by livestock and where ground squirrels (gophers) are abundant are a favorite nesting habitat of the Burrowing Owl. Prior to applying Furadan 480F, the user must determine whether Burrowing Owls are in or around the area to be treated and must not apply Furadan 480F within 250 meters of Burrowing Owl nests. Information in identification, range and habits of the Burrowing Owl can be obtained by calling: Fish and Wildlife Division, Red Deer (340-5142) or Lethbridge (381-5281).
12. **STORAGE:** Do not store below $2^{\circ}C$.

GASTOXIN (aluminum phosphide)

United AgriProducts

DANGER POISON

1. **FORMULATIONS:** Tablets, 3 g; release 1 g phosphine upon decomposition; 1 kg flask. Pellets, 0.6 g; release 0.2 g phosphine upon decomposition; 1 kg flask.
2. **MARKETING CATEGORY: Restricted.** A permit must be obtained from your local Agricultural Fieldman or Alberta Environment prior to purchase or use of these products.
3. **REGISTERED USES:** Raw agricultural products, grain, processed foods and feeds.
4. **INSECTS CONTROLLED:**

almond moth	dermestids	Indian meal moth	pink bollworm
Angoumois grain moth	dried fruit moth	khapra beetle	raisin moth
bean weevil	rusty grain beetle	lesser grain borer	saw-toothed grain beetle
cadelle	flour beetles	Mediterranean flour moth	tobacco moth
cigarette beetle	granary weevils		

5. **WHEN USED:** when the temperature is above 5°C.
6. **HOW TO APPLY:**

Rate:

Uses	Tablets	Pellets
Raw agricultural commodities, grain and bulk animal feeds.	4-6/m^3(60-180/1000 bu)	5-10/m^3(120-300/1000 bu)
Processed foods	16/10 m^3(30-60/1000 ft^3)	6/m^3(100-200/1000 ft^3) of storage space
Cereal mills, feed mills, warehouses.	7-11/10 m^3(20-30/1000 ft^3)	4-6/m^3(100-150/1000 ft^3) of storage space

Commodity temp. °C	Tablets - Exposure Times (days)	Pellets - Exposure Times (days)
over 20	3	2
6-20	4	3
12-15	5	4
5-11	10	9
below 5	Do not fumigate	Do not fumigate

Note: Suggested exposures should be observed. A shortened exposure period cannot be compensated for by increased dosage.

7. **APPLICATION TIPS:**
General: Never fumigate alone. Have appropriate gas detection devices available for use as needed. **Never** fumigate any structure or area unless it is unoccupied.
Fumigating Flat Storages (Quansets, granaries): Make certain that the structure is tight enough to be fumigated successfully. Seal structure as needed. Make certain that there are no adjoining structures occupied by man or animals. During fumigant application leave all doors or other openings open to create a cross ventilation. Application can proceed for 2-4 hours or until the odor of phosphine is detected in the overspace. Apply the tablets or pellets using a pipe 3 cm in diameter and 1.5 meters long. Make probes every 1.5 meters horizontally across the grain in both directions. The number of tablets or pellets used per probe is determined by dividing amount of fumigant to be used by number of probings to be made. Fumigant is dropped in the pipe at intervals of 15 cm as the pipe is withdrawn from the grain. A plastic tarp may be pulled over the grain surface following application. This reduces convection currents and increases the effectiveness of the fumigant. Care must be taken to see that the plastic is removed when fumigation is completed (no more than 5-6 days or sweating of grain may occur). Close and seal all external openings. Placard and lock all entrances. Following the exposure period, open doors and windows creating a cross draft to aid in aeration. Make certain all warning signs are removed when aeration is complete.
8. **HOW IT WORKS:** Phosphine (hydrogen phosphide) is a colourless gas with a carbide-like odour and high volatility. Formulated product consists of aluminium phosphide, ammonium bicarbonate, urea and paraffin. Upon exposure to air, the ammonium bicarbonate breaks down to form ammonia (a pungent, warning gas) and carbon dioxide (a fire suppressant). Within 1-4 hours, depending on temperature and humidity, the product begins to release phosphine and decompose.
9. **EXPECTED RESULTS:** The effectiveness of fumigation is primarily dependent upon temperature, tightness of seal, the type of storage space, exposure time and dosage. Therefore, a range of dosages and exposure times are suggested.
10. **RESTRICTIONS ON TREATED GOODS:** Aerate finished food for 48 hours before it is offered to the consumer.
11. **TOXICITY:** Hydrogen phosphide gas is very toxic to all forms of animal life, and exposure to even small amounts should be prevented. Poisoning results from ingestion or inhalation as hydrogen phosphide is not absorbed through the skin. It is also insoluble in water, fats, and oils.

12. **PRECAUTIONS, FIRST AID:**
Protective Equipment: It will be necessary to wear a gas mask if: (a) a structure under fumigation must be entered in case of emergency or (b) a structure must be entered to commence aeration procedure. Otherwise, it is not necessary to wear a gas mask when product is applied according to label directions. Wear gloves when handling the product. Open containers only in open air and with the opening pointing away from your face. Use entire contents of a tube once it is opened. Unopened tubes and resealable flasks may be returned to the locked storage area for later use. Wash hands after use of the product.
Reduce Gas Hazards: Never let tablets or pellets come in direct contact with liquid - this causes the immediate release of hydrogen phosphide. **Never** confine the product in small gas proof enclosures such as plastic bags. Such confinement could cause the gas concentration to reach the lower flammability level. Take precautions in areas where copper, brass or gold are present, as corrosion may occur. **Never** fumigate in areas containing electronic or telephone equipment, photographic film or copy paper. It may be possible to remove such items or protect them from exposure to the gas. Hydrogen phosphide has great penetrating power and gas may slowly seep through concrete block walls. Hydrogen phosphide does not layer, but expands to fill the available space.
Symptoms of poisoning: Severity is dependent on concentration of hydrogen phosphide involved. Mild poisoning results in fatigue, nausea, pressure or pain in the chest, ringing in the ears, and uneasiness. Hydrogen phosphide is not a chronic poison, and these symptoms will readily disappear with rest and fresh air. Greater quantities of gas produce such symptoms as vomiting, stomachache, diarrhea, disturbance in equilibrium, and dyspnea (difficulty in breathing). Very high concentrations quickly cause bluish-purple skin colour, agitation, poor muscle co-ordination, sub-normal blood oxygen content, unconsciousness and death. Death can occur very quickly, or b delayed several days as a result of pulmonary edema and collapse, by paralysis of the central respiratory system. In cases of severe poisoning, disturbance in liver and kidney function can also occur.
First Aid: Should exposure to hydrogen phosphide be documented or suspected - remove patient from gas atmosphere to open air. **Call a physician immediately.** Have patient lay down, keeping him warm and comfortable. Treat as for shock. Make **no** antidotal use of fats, oil, butter, or milk. Do **not** administer atropine as it is contraindicative. Commence artificial respiration if breathing has ceased. When exposure to low concentrations of hydrogen phosphide have been documented or suspected, the individual involved should rest for 24 hours and under no circumstances should he resume any work dealing with fumigation.

13. **STORAGE:** Tablets and pellets are received in wooden cases containing sealed tubes and cans, or resealable flasks. As long as the tubes, cans or flasks remain intact, the storage life of the product is unlimited. Storage should be in a dry, locked, ventilated area and out of the reach of children and irresponsible persons.

GUTHION/APM (azinphos-methyl)

Chemagro/ICI Chipman

DANGER POISON

1. **FORMULATIONS:** Spray Concentrate (SC); 240 g/L; 20 L pail. Wettable Powder (WP); 50%; 6 X 2 kg pack.
2. **REGISTERED MIXES:** None.
Mixing Instructions: Wettable Powder: mix the required amount with a small quantity of water. Add this pre-mix through the screen while filling the sprayer tank or fill the tank to the required level and then add the pre-mix. Operate the agitator while mixing. Spray Concentrate: pour the required amount into full amount of water and then agitate.
3. **CROPS:** Alfalfa, barley, canola, clover, oats, potatoes, rye, sugar beets, wheat.
4. **INSECTS CONTROLLED:**

alfalfa plant bug	diamondback moth	lygus bugs	sweet clover weevil
alfalfa weevil	flea beetles	mites	tarnished plant bug
aphids	grasshoppers	red turnip beetle	
Colorado potato beetle	leafhoppers	spittle bug	

5. **WHEN USED:** Maximum number of applications: one per season on barley, oats, rye, sugar beets, wheat. One per season on alfalfa and clover except 2 per season for sweet clover weevil control or when using rates of 910 mL SC/ac or less. Repeat as necessary on canola and potatoes. Red turnip beetle - repeat as necessary.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Water Volume: Air: 16 L/ac minimum. Ground: 32 L/ac minimum. Alfalfa weevil: 60-80 L/ac on heavy growth.
Nozzles: When spraying canola and sugar beets, wettable powder may be applied using any commercial tractor, or drawn or self-propelled field sprayer provided it is equipped with the following: nozzle tips no finer than 6502, 8002 or TK2 with nozzle screens no finer than 50 mesh. These tips will provide 40 L/ac when operated at 8 km/h and 200 kPa. 50 mesh or larger line strainers or screens. Note that felt filters, smaller nozzle tips or smaller screens will become clogged when using the wettable powder formulation.

Rate: Lower rate on immature insects, light infestations or sparse foliage.

Crop	Insect	Liquid mL/ac	Powder g/ac
Alfalfa, clover.	Alfalfa plant bug, alfalfa weevil, aphids, leafhoppers, lygus bugs, mites, spittle bugs.	900-1400	445-710
	Grasshoppers	425-700	
	Sweet clover weevil	910	445 g
Canola	Diamondback moth	225-505	110-225
	Flea beetles	110-225	60-110
Canola	Red turnip beetle	225-345	110-170
Barley, oats, rye, wheat.	Grasshoppers	425-700	
Potato	Aphids	1400	710
	Colorado potato beetle	510-710	225-345
Potato	Flea beetle, leafhoppers, spittle bug, tarnished plant bug.	900-1400	445-710
Sugar beets	Flea beetles	110	60

7. **APPLICATION TIPS:** For red turnip beetle, spray an 18-30 m wide band around the field or where beetles are causing damage. The spray concentrate forms an emulsion when diluted with water and is suitable for use in all power-operated ground sprayers and aircraft sprayers. Do not apply when crop is in bloom or allow spray to drift towards beehives. Do not use on greenhouse food crops or other crops used for food or forage. Use only according to label directions. Application at rates above those shown may result in illegal crop residues.
8. **HOW IT WORKS:** Azinphos-methyl is a contact, non-systemic, organophosphate insecticide and acaricide.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest or pre-grazing interval (days): alfalfa, clover (21); canola, cereals (30); potatoes (7); sugar beets (100).
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = technical (11), 50% Wettable powder (34), spray concentrate (21). Highly toxic to bees exposed to direct treatment or residues on crops. Poisonous if swallowed, inhaled, or absorbed through the skin.
11. **PRECAUTIONS, FIRST AID:** Highly flammable. Can be absorbed through the skin. Do not get in eyes or on skin. Wear protective clothing, natural rubber gloves, and goggles. Do not breathe dust or spray mist. Wear a pesticide respirator. Keep all unprotected persons out of the operating area or vicinity where there may be danger of drift. Workers who must enter treated fields within 2 days of application should wear protective clothing. Wash hands, arms, and face thoroughly with soap and warm water before eating or smoking. Wash all contaminated clothes with soap and hot water before reuse. **Keep out of reach of children. Do not contaminate feed or food.**
Symptoms of poisoning: Tightness in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea.
First Aid: Call a physician immediately. Have patient lie down and keep quiet. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
For Physician: Compound inhibits cholinesterase, resulting in stimulation of the central nervous system, the parasympathetic nervous system, and the somatic motor nerves. Do **not** give morphine. Watch for pulmonary edema which may develop in serious cases of poisoning even after 12 hours. At first sign of pulmonary edema, the patient should be placed in an oxygen tent and treated symptomatically. **Antidote is atropine sulphate** in large therapeutic doses. Repeat as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine.
12. **STORAGE:** Do not store spray concentrate below -4°C. Protect products from heat and open flame. Do not heat.

LANNATE L (methomyl)

DuPont

DANGER POISON

CAUTION FLAMMABLE

1. **FORMULATIONS:** Water Soluble Liquid; Lannate L; 215 g/L; 10 L jug.
2. **REGISTERED MIXES:**
Mixing Instructions: Add 1/4-1/2 required amount of water. Add Lannate L directly to tank, mix thoroughly. Once dissolved, continued agitation is not required. Do not use air agitation.
3. **CROPS:** Barley, canola, corn (sweet), flax, oats, potatoes, wheat.
4. **INSECTS CONTROLLED:**

alfalfa looper	beet webworm	European corn borer	leafhopper
aphids	corn earworm	flax bollworm	thrips
armyworm (bertha, common)	cutworm (clover, variegated)	flea beetle	

5. **WHEN USED:** When insects are causing economic damage; applications at 5-7 days intervals as needed. No restriction on number of applications. Early morning or late evening sprays are recommended.
Corn earworm and European corn borer: At 3-5 day intervals as needed.
6. **HOW TO APPLY:**
With: Aircraft (barley, canola, flax, oats, wheat) or Ground equipment (all crops).

Water Volume: Air: 16 L/ac minimum. Ground: 20-60 L/ac.
Rate: Low rate only for very young insects, small plants, or light infestations.

Crop	Insect	L/ac	Crop	Insect	L/ac
Barley, oats, wheat	Common armyworm	0.5-0.9	Corn (sweet)	Corn earworm, Aphids	0.8-1.1
	Thrips	0.5		European corn borer	1.1
Canola	Alfalfa looper, bertha armyworm, beet webworm, clover cutworm.	0.4-0.5	Flax	Bertha armyworm, flax bollworm.	0.4-0.5
			Peas	Aphids,alfalfa looper	0.9
	Variegated cutworm	0.5-0.9	Potato	Aphids, flea beetles, leafhoppers.	0.9

7. **APPLICATION TIPS:** Apply at the recommended rates in sufficient water to obtain thorough, uniform coverage. Best control is obtained when spray schedules are initiated on young insects. For European corn borer, spray two days after peak moth flight, when numbers warrant control - consult your district agriculturist. To control severe infestations, use 1-3 applications of the highest recommended rate then use the lowest rate possible to maintain control. Use only in commercial plantings; do not use in home plantings.
8. **HOW IT WORKS:** A carbamate insecticide which works by contact and ingestion and has some systemic action. Rapidly degraded in green, growing plants; short-term residual. Rapid knock-down.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval (days): Barley, oats, wheat (20); Canola, flax (8); Corn (sweet), potatoes (3).
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (17-24). Toxic to bees. May be fatal or cause blindness if swallowed. Poisonous if inhaled. Causes eye damage.
11. **PRECAUTIONS, FIRST AID:** Can be absorbed through the skin. Intake can cause heart, liver and kidney damage. Do not get in eyes or on clothing. Wear goggles, boots, gloves, and respirator (Willson Agri-Tox R-533 Model A-Tx-2, Filter R15, Cartridge R21; or Mine Safety "Comfo" 2). Extremely flammable; keep away from heat, sparks, and open flame. Do not breathe vapors or spray mist. Use in an adequately ventilated area. Aircraft pilot should not assist in the mixing and loading operation. Apply when bees are not foraging.
Symptoms of poisoning: Weakness, blurred vision, headache, nausea, abdominal cramps, discomfort in the chest, constriction of pupils, sweating, slow pulse, or muscle tremors.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
For Physician: Administer atropine sulphate in repeated doses, 1.2-2.0 mg intravenously every 10-30 minutes until full atropinization is achieved. Maintain atropinization until patient recovers. Do **not** use morphine. 2-PAM may be used to supplement atropine treatment.
12. **STORAGE:** Do not store below 0°C. Above 136°C, product decomposes and may explode if confined. Keep away from heat, sparks, and open flame.
13. **DECONTAMINATION:**
Spill or Leak Procedure: Do not get in eyes, on skin or clothing. Keep people away and upwind of spill/leak. If necessary to enter the spill area, wear self-contained breathing apparatus, gloves, boots, and protective clothing. Remove leaking containers and put them into leak-proof containers. Sweep up spills; apply earth, sand or sweeping compound to spill area and re-sweep to pick up residue. Package spill material in plastic, cardboard or metal containers; dispose in accordance with provinicial regulations. If product enters crevices and cannot be effectively swept, treat with a sodium hydroxide (Drano) water solution and allow to stand 4 hours. Thereafter, flush well with water; do not flush into any body of water. If product enters sewers or bodies of water, notify appropriate local and federal authorities.

LORSBAN 4E (chlorpyrifos)

DowElanco

DANGER POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 480 g/L; 10 L jugs.
2. **REGISTERED MIXES:** None.
Mix Restrictions: Do not add any additional adjuvants, surfactants, or spreader stickers.
3. **CROPS:** Barley, canola, corn (field, sweet), flax, oats, potatoes, sugar beets, sunflowers, wheat.
4. **INSECTS CONTROLLED:**

alfalfa looper	cutworms (army, black,	diamondback moth larvae	Russian wheat aphid
armyworm (bertha, common)	dark-sided, pale western,	grasshoppers	tarnished plant bug
Colorado potato beetle	red-backed, variegated)	potato flea beetle	wheat midge

5. **WHEN USED:** When economic damage is apparent or when insect numbers reach the economic threshold.
Wheat midge: When adults are found in crop (1 midge/4-5 wheat heads). When 25% of wheat head has emerged from boot, but preferably delayed until flowering (in 30% of crop).
Number of applications: 1/season as a foliage treatment of barley, canola, oats, or wheat; a seedling or soil treatment of potatoes; a seedling treatment of canola, flax, sugar beet, sunflower. oMaximum of 9 weekly applications on potato foliage.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.

Water Volume:

Air:

Foliage: Barley, oats, wheat: (brown wheat mite) 4-12 L/ac, (other insects): 5-20 L/ac. Canola: 4 L/ac.

Seedlings: Canola, flax: 4-8 L/ac.

Ground:

Foliage: Barley, canola, oats, wheat (grasshoppers) 40-80 L/ac. Barley, oats, wheat (armyworms, cutworms, wheat midge) 20-80 L/ac. Canola (other than grasshoppers) 16 L/ac.

Seedlings: Canola, flax, sugar beets, sunflower: 32-80 L/ac. Corn, potatoes: 80-160 L/ac.

Rate: Lower rate for young insects, light infestations or sparse foliage.

Crop	Stage	Insect	mL/ac
Canola, flax.	seedling	Cutworms (army, dark-sided, pale western, red-backed, variegated).	350-485
Corn (field, sweet), potatoes.	seedling	Cutworms (black, dark-sided, red-backed).	485-970
Sugar beets	seedling	Cutworms (pale western, red-backed).	485-970
Sunflower	seedling	Cutworms (army, pale western, red-backed).	485
Barley, oats, wheat.	foliage	Armyworm (bertha, common), cutworms (army, dark-sided, pale western, red-backed).	350-485
		Grasshoppers (young)	235
		Grasshoppers (all stages)	355
		Brown wheat mite	250
		Russian wheat aphid	400
		Wheat midge	325
Canola	foliage	Alfalfa looper, armyworm (bertha, common).	305-405
		Diamondback moth (larva)	405-605
		Grasshoppers	235-355
Potatoes	foliage	Colorado potato beetle, potato flea beetle, tarnished plant bug.	405

7. **APPLICATION TIPS:**
Cutworms: Higher rates when the top 1 cm of soil surface is extremely dry or when the infestation is heavy.
Foliage treatments: When spraying crops near maturity, an application system that gives maximum penetration of the crop canopy is necessary to get good insect kill. Do not apply to crops in bloom.
8. **HOW IT WORKS:** A broad-spectrum, non-systemic insecticide. Works by contact, ingestion and vapour action.
9. **EXPECTED RESULTS:** Insects must come in direct contact with the insecticide in order to be affected. Degrades on foliage by weathering, and a significant kill of insects eating treated foliage may not last beyond 48 hours after treatment. Somewhat more persistent in soil and control of soil-borne insects may be more durable.
10. **EFFECTS OF RAINFALL:**
Foliar treatments: should be made 4-6 hours before forecasted rainfall.
Soil treatment: before forecasted heavy rainfall should be avoided. A light rainfall during or after application is probably helpful.
11. **MOVEMENT IN SOIL:** Binds to organic matter in soil, and is not likely to leach in soils with some organic matter.
12. **GRAZING AND HARVEST RESTRICTIONS:** Wait-interval for canola is counted from day of processing. Pre-harvest interval (days).
Foliage: Barley, oat, wheat (60); canola (21); potato (7).
Seedling: Canola, flax (21); corn, potatoes (70); sugar beets, sunflowers (90). Cover crop treated with Lorsban should not be used for human or animal consumption.
13. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (135-163). Toxic to bees and fish.
14. **PRECAUTIONS, FIRST AID:** Protective Equipment: Wear protective gear to avoid contact with skin or eyes. Do not inhale vapours or spray mist. Keep away from heat, sparks, and open flame. **Keep out of reach of children.**
Symptoms of poisoning by inhalation: Stuffy, runny nose, scratchy throat, asthmatic wheezing, sudden bronchospasm, swelling of oral and laryngeal mucous membranes, shock.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention.
For Physician: Contains a cholinesterase inhibitor and a solvent. **Antidote is atropine.**
15. **STORAGE:** Combustible liquid; keep away from heat, sparks, and open flame.

MALATHION, CYTHION (malathion)

Cyanamid/United Agri Products/Sanex

CAUTION POISON

1. **FORMULATIONS:** Emulsifiable Concentrates; Malathion (500, 50EC, 5E), Cythion; 500 g/L; 4 X 4 L, 20 L can. Liquid: Cythion Liquid Grain Protectant; 83.6% Malathion; 1 kg/L; 4 X 4 pack. Dust: 2% Malathion; 2%; 22.7 kg bag. Grain Protectant; 0.5%; 20 kg bag.
2. **REGISTERED MIXES:**
3. **CROPS:** Alfalfa, barley, canary seed, canola, clover, corn, flax, lentils, mustard, oats, pasture, potatoes, rye, stored grain, sugar beets, sweet clover, wheat.
4. **INSECTS CONTROLLED:**

Foliar Spray

alfalfa weevil larvae	English grain aphid	lygus bug
aphids	European corn borer	spider mite
army worms	flea beetles	spittle bug (adults)
Colorado potato beetles	grasshoppers	sweet clover weevil
corn earworm	greenbug	winter grain mite
diamondback moth larvae	leafhoppers	

Stored Grain Treatment

grain beetles (flat, rusty, saw-toothed)	flour beetles (onfused, red)	lesser grain borer
grain mites	Indian meal moth	weevils (granary, rice)

5. **WHEN USED:**

Foliar Spray: Legumes - when 75% of foliage shows feeding damage. Do not apply to legumes in bloom. Sweet clover - spray field margins of first year clover in late summer or early fall when migration of weevil adults is occurring. Canola, flax - when bees are absent from field and temperatures is above 18°C. Sugar Beets - at 3-5 leaf stage when insects or damage first appears.

Stored Grain Treatments: As grain is being loaded or turned into final storage. Surface protectant - immediately after grain is loaded into storage.

6. **HOW TO APPLY:**

(A) Emulsifiable Concentrates

With: Aircraft or Ground equipment.

Water Volume: Potato pests - 400 L/ac.

Rate: Lower rate for immature insects, light infestations or sparse foliage.

Crop	Insect	L/ac
Alfalfa	Alfalfa weevil larvae, lygus bug, spittle bug adults.	0.9-1.1
Alfalfa, clover.	Aphids, grasshoppers, leafhoppers, spider mite.	0.9-1.1
Canola, mustard.	Flea beetles	0.4-1.1
	Diamondback moth larvae	0.2-0.3
Canola, mustard, flax, pastures.	Grasshoppers	0.4-1.1
Canary seed	Aphids	0.6
Cereals	Armyworms, English grain aphid, greenbug, winter grain mite.	0.4-1.1
Cereals, hay.	Grasshoppers	1.1
Corn (grain, forage).	Corn earworm, European corn borer	0.9-1.1
Lentils	Grasshoppers	0.7
Potatoes	Aphids, Colorado potato beetle, leafhoppers, spider mites.	0.6-0.9
Sugar beets	Flea beetles	0.4
Sweet clover	Sweet clover weevil	0.6-1.0

(B) Stored Grain Treatments

With: Spray or Dust applicators.

Water Volume: 10-20 L water; Indian meal moth (surface treatment) 5-10 L water.

Incorporation: Add to grain as it is being augered, or scatter proper amount of dust on each load and cut in with shovel before dumping.

Rate:

Note: Treated grain should not be offered for sale until 7 days after treatment.

Insect	Grain	Liquid mL/1000 kg grain	0.5% Dusts g/1000 kg grain	2.0% Dusts g/1000 kg grain
Grain beetles (flat, rusty, saw-toothed); grain mites; lesser grain borers; flour beetles (confused, red); weevils (granary, rice); Indian meal moth.	Barley	12	2000	520
	Corn	10	—	—
	Oats	17	3000	735
	Rye	10	1750	450
	Wheat	10	1750	415
Indian meal moth	Barley, corn, oats, rye, wheat.	300 mL/100 m^2 of grain surface	—	—

7. **APPLICATION TIPS:**
All crops: Apply when day temperature is expected to exceed 20°C.
Stored Grain: To protect from Indian meal moth, spray evenly over the surface of clean or uninfested grain and rake to a depth of 15 cm. Where special application equipment is not available, any type of low pressure sprayer holding 5 L or more can be used. Apply spray to the grain stream as it is being elevated into storage. Test sprayer calibration by discharging into a tank of water, then regulate flow of grain to get the proper rate of spray. Keep spray coarse to avoid loss as "drift".
Before storing new grain: Thoroughly clean up old grain and debris from bins, elevators, or grain handling equipment. Remove and burn all sweepings. After cleaning the premises, apply a residual malathion spray to walls, floors and machinery in grain elevators or farm storage, using 200 mL Grain Protectant/5 L water. Force spray into cracks and crevices. Apply at 5 L of spray/100 m^2 of surface area using a coarse wetting spray. Wait until spray has thoroughly dried before storing grain in treated areas. Spray this mixture around the outside of bins and elevators to help prevent re-infestation.
8. **HOW IT WORKS:** A non-systemic, contact, organophosphate insecticide and acaricide of brief to moderate persistence. Generally non-phytotoxic. Do not apply foliar sprays at temperatures below 20°C.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest and pre-grazing intervals (days): canola (7), cereals (7), flax (7), hay (7), legumes (7), mustard (7), pastures (0), potatoes (3).
Forages and pasture: Remove cattle before spraying; cattle may be returned immediately after spraying.
10. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (2,800). Highly toxic to bees and fish.
11. **PRECAUTIONS, FIRST AID:** Flammable. Can be absorbed through the skin. Wear protective gear to avoid contact with skin or eyes - do not inhale vapour, spray mist or dust. Do not apply to plants in bloom.
Symptoms of poisoning: Headache, weakness, sweating, giddiness, blurred vision, nausea, abdominal cramps, diarrhea, and discomfort in chest.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
Notes to Physician: It is a cholinesterase inhibitor. Atropinise slowly to avoid cardiac arrest. Do not give respiratory depressants.
12. **STORAGE:** Do not store near food or feed. Keep container tightly sealed when not being used.
13. **DECONTAMINATION:** Malathion breaks down rapidly in the presence of water and alkaline materials. Containers and spillages can be readily
decontaminated by use of Javex or lye, or washing soaps containing sodium hydroxide.

MONITOR (methamidophos)

Chemagro/Chevron

1. **FORMULATIONS:** Liquid; 480 g/L; 10 L pail.
2. **REGISTERED MIXES:** Compatible with most commonly used fungicides.
3. **CROPS:** Canola, potatoes.
4. **INSECTS CONTROLLED:**

aphids	Colorado potato beetle	potato flea beetle
bertha armyworm	grasshoppers	potato leafhopper

5. **WHEN USED:**
Canola: Bertha armyworm: when larvae number 20 or more /m^2 and are feeding on pods or flowers; maximum 2 applications per season.
Grasshoppers: When migration of grasshoppers from ditches and field borders cause economic damage; maximum 2 applications per season.
Potatoes: Apply in a 10-14 day program when necessary.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Water Volume: Air (canola): 4 L/ac minimum. Ground: 80-400 L/ac.
Rate: Higher rate for severe infestations, adult insects, or dense foliage.

Crop	Insect	mL/ac
Canola	Bertha armyworm	230-500
	Grasshoppers	500
Potato	Aphids, Colorado potato beetle, potato flea beetle, potato leafhopper.	710-910

7. **APPLICATION TIPS:** Avoid use during flowering and pollination periods.
8. **HOW IT WORKS:** Methamidophos is a broad spectrum organophosphorus insecticide and acaricide which works by contact and systemic action. Non-phytotoxic when used as directed. Contact effectiveness may persist for 7-21 days.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval (days): canola (10), potatoes (14).
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = 95% technical (13-15), Monitor 4 (17-20). Extremely toxic to wildlife. Highly toxic to bees exposed to direct treatment or residues on crops.
11. **PRECAUTIONS, FIRST AID:** Can cause burns to both skin and eyes. Do not inhale vapours or spray mist. Wear a protective respirator suitable for protection against organophosphorous insecticides. Wear standard protective clothing (see page xx), rubber gloves, and goggles. Keep unprotected personnel out of mixing and spray area. **Do not apply** under conditions involving possible drift to food, forage or other planting that might be damaged or the crops thereof rendered unfit for sale, use or consumption.
Symptoms of poisoning: Tightness in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea.
First Aid: In case of poisoning get medical attention immediately. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
For Physician: Antidote is atropine sulphate administered in large therapeutic doses repeated as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine. Do **not** give morphine.
12. **STORAGE:** Store and display apart from food or feed. Do not store in or around the home. Store in a cool, dry place but not below -10°C. Protect from heat.

PIRIMOR (pirimicarb)

ICI Chipman

DANGER POISON

1. **FORMULATIONS:** Wettable Powder; 50%; 1 kg, 20 kg bags.
2. **REGISTERED MIXES:** Compatible with thuricide HPC, Dipel, Sevin.
3. **CROPS:** Corn (sweet), peas, potatoes.
4. **INSECTS CONTROLLED:** Aphids on corn, buckthorn aphid, green peach aphid, pea aphid.
5. **WHEN USED:** Potatoes: repeat applications as required to maintain control. Corn: make 1 application only.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Water Volume: Peas: 7 L/ac minimum for aircraft. Potatoes: 200-400 L/ac.
Rate: Higher rate when aphid populations are high or under very cool weather conditions.

Crop	Insect	g/ac
Corn (sweet)	Aphids	222
Peas	Pea aphid	60-110
Potatoes	Green peach aphid, buckthorn aphid.	172-222

7. **APPLICATION TIPS:** Apply in enough water to ensure thorough coverage of all foliage.
8. **HOW IT WORKS:** Works by contact, vapour and local systemic action. Is specific to aphids and fits into integrated control programs.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval (days): potatoes (7), peas (6), corn (3).
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (147). Low toxicity to fish.
11. **PRECAUTIONS, FIRST AID:** Highly flammable. Avoid breathing dust or spray mist. Avoid contact with skin and eyes. Wear standard protective clothing (see page xx), gloves, overalls and eye protection. Wash hands and exposed skin before meals and after work. Change contaminated clothing daily.
Symptoms of poisoning: Blurred vision and/or breathing difficulties. If symptoms occur, move out of sprayed area and call a doctor.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
For Physician: Pirimor is a moderate, reversible cholinesterase inhibitor. **Atropine is antidotal**, at 1-4 mg by intramuscular injection, followed by a further 2 mg every 30 minutes as necessary. P2S and 2-PAM are not effective.
12. **STORAGE:** Store in original container in dry place.

SEVIN (carbaryl)

Rhône - Poulenc

1. **FORMULATIONS:** Liquid Suspensions; XLR-Plus; 480 g/L; 10 L jug. Wettable Powder; 50W; 50%; 2 kg bag. Sprayable Powder; 80S; 80%; 4.5 kg bag.
2. **REGISTERED MIXES:** Most formulations are compatible with a wide range of pesticides. Do **not** apply mixes if they are physically incompatible (e.g. curdle or precipitate). Liquid formulations are **not** compatible with diesel fuel, kerosene, fuel oil, aromatic solvents, or any Stampede formulation. All formulations are unstable when mixed with alkaline materials such as Bordeaux mixture, lime-sulphur and casein-lime spreaders.
   Mixing Instructions: Prepare only the required amount of spray on the day of application. Do not store spray mixtures overnight. Agitate, stir, or recirculate all carbaryl sprays prior to use.
3. **CROPS:**

alfalfa	forage grasses	potato
barley	non-crop areas	rangelands
canola	oats	rye
clover	pastures	wheat
corn (field, sweet)		

4. **INSECTS CONTROLLED:**

alfalfa caterpillar	corn earworm	potato flea beetle
alfalfa weevil larvae	European corn borer	stink bug
armyworm	fall armyworm	sweet clover weevil
blister beetles	flea beetles	tarnished plant bug
climbing cutworms	grasshoppers	webworm
Colorado potato beetle	leafhoppers	

5. **WHEN USED:** Apply when necessary to prevent economic damage.
6. **HOW TO APPLY:**
   With: Aircraft or Ground equipment. Clean lines and tank after spraying.
   Rate: Lower rate on immature insects, light infestations, or sparse foliage. Higher rate for adult insects, severe infestations, or dense foliage.

Crop	Insect	XLR-Plus L/ac	50 W kg/ac	80 S kg/ac
Canola (seedlings only, up to 4 weeks after emergence)	Flea beetles	0.2	--	0.3
	Grasshoppers: nymph	0.50-1.0		
	adult	1.0-1.4		
Barley, oats, rye, wheat.	Grasshoppers: nymph	0.5-1.0	0.45-0.9	0.3-0.6
	adult	1.0-1.4		
Alfalfa, clover.	Blister beetle	1.0-1.6	0.9-1.3	0.6-0.7
	Alfalfa caterpillar, armyworm, webworm.	1.0-2.1	0.9-1.8	0.7-0.9
	Alfalfa weevil larvae	--	1.3	0.9
	Climbing cutworm	--	0.9-1.8	0.6-1.2
	Blister beetle, flea beetles, leafhoppers.	1.0-1.6	0.9-1.3	0.6-0.7
Corn (field, sweet)	Corn earworm, European corn borer, fall armyworm.	1.0-1.6	0.9-1.3	0.6-0.9
	Climbing cutworm	2.1	42.5 g/100 m row	1.2
	Grasshoppers: nymph	0.5-1.0,	--	--
	adult	1.0-1.4,	--	--
Potato	Colorado potato beetle	0.5	0.45	--
	Leafhoppers	0.5	0.9	0.6
	Potato flea beetle	0.5	0.9	0.3-0.6
Forage grasses, pastures, rangeland, non-crop areas.	Grasshoppers (nymphs or sparse vegetation)	0.5-1.0	--	--
	Grasshoppers (adults or dense vegetation)	1.0-1.4	--	--

Water Volume: Aircraft: 4 L/ac minimum. Ground: 12 L/ac minimum.
XLR-Plus: Dilutions greater than 1:39 will reduce wash off resistance.
50W: Aircraft: 4-14 L/ac; Ground: 11-14 L/ac. Climbing cutworms: Corn - 89-142 L/ac; Forages, cereals: 229 L/ac minimum; Potato: 91-111 L/ac.
80S: Corn, potatoes: use sufficient water to obtain full coverage; Climbing cutworms: 89-111 L/ac. Forages, cereals: 22-178 L/ac; Climbing cutworms: 223 L/ac minimum.
All Crops: Use sufficient water to obtain thorough and uniform coverage of spray depending on equipment, severity of infestation and stage of crop growth.
Low volume air applications: Hot, dry conditions may cause excessive evaporation of droplets. A higher spray volume per acre may be required under hot, dry conditions and when crop canopies are particularly dense.

Nozzles: Low volume applications:
Wettable Powder: 50-mesh or coarser screens in entire system; cone type nozzles, No. 3 or larger.
XLR-Plus: 50-mesh, in-line strainers and 25-mesh, slotted strainers behind the nozzle; cone type nozzles, sizes D0-45 or D8-45.
Note: Flat fan nozzles may be used but care should be taken as excessive droplet breakup and resulting production of fine droplets may occur. Flat fan nozzles are also prone to plugging under hot, dry conditions.

7. **APPLICATION TIPS:** Timing and good coverage are essential for effective control. Calibrate spray equipment to deliver the required volume. Agitate, stir or recirculate all carbaryl formulations prior to use.
Corn: Treat entire plant for larvae in whorls or foliage feeders. Spray in 25-30 cm band over the row for climbing cutworms. Apply at 2-4 day intervals, if necessary, for insects attacking silks and ears; start when first silks appear and continue until silks begin to dry (3 or more applications may be needed).
Alfalfa Weevil: If pre-treatment damage is extensive, cut and make application to stubble.
8. **HOW IT WORKS:** A carbamate insecticide which works by contact and ingestion. Moderate to rapid in speed of action with short to moderate residual effectiveness (2 days to 4 weeks) depending on crop/pest complex, formulation and climatic conditions.
9. **EXPECTED RESULTS:** Some immediate control is expected but the majority of control occurs 24-48 hours after application.
10. **EFFECTS OF RAINFALL:** Do not apply just before rain.
XLR-Plus: Maximum resistance to wash off is obtained in the range of 1:1-1:39 (XLR-Plus:Water) dilution.
50W/80S: Do not apply to wet foliage or when rain or high humidity is expected during the next 2 days.
11. **MOVEMENT IN SOIL:** None.
12. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest or pre-grazing interval (days): Barley, oats, rye, wheat (14); corn (1); potatoes (7). Alfalfa, clovers, forage grasses, pasture, rangeland, non-crop areas (0). Remove cattle from area to be sprayed. Cattle may graze immediately after application. Treated forage and feed crops may be fed to dairy animals and animals for slaughter provided sprays are applied as directed.
13. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (540). Although carbaryl is toxic to honey bees, Sevin XLR and XLR-Plus have a reduced honey bee hazard warning; do not apply directly to foraging bees.
14. **PRECAUTIONS, FIRST AID:** Can be absorbed through the skin. Wear protective gear to avoid contact with skin and eyes - do not inhale spray mist. Except for the XLR formulation, carbaryl should not be applied to crops in bloom. XLR can be applied when bees are not foraging provided the residue on the plants is dry before foraging commmences.
Symptoms of poisoning: Salivation, tearing, urination, defication, pinpoint pupils, muscle spasms, general muscular weakness, nausea, prostration, convulsions.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
For Physician: Carbaryl insecticide is a moderate, reversible, cholinesterase inhibitor. **Atropine is antidotal.** Do not use 2-PAM opiates, or cholinesterase inhibiting drugs.
15. **STORAGE:** Do not store where temperature frequently exceeds 38°C. All formulations will withstand freezing.

SUPRACIDE (methidathion)

Ciba-Geigy

DANGER POISON

CAUTION FLAMMABLE

1. **FORMULATIONS:** Emulsifiable Concentrate; 240 g/L; 2 X 10 L pack.
2. **REGISTERED MIXES:** None. Supracide is compatible with many fungicides.
3. **CROPS:** Alfalfa, canola, mustard, potato, sunflower.
4. **INSECTS CONTROLLED:**

alfalfa weevil	leafhopper	potato leafhopper	sunflower maggot
Colorado potato beetle	lygus bugs	red turnip beetle	sunflower moth
diamondback moth	painted lady butterfly	sunflower beetle	tarnished plant bug
flea beetles	pea aphid		

5. **WHEN USED:**
Alfalfa: Alfalfa weevil: when 20-30% of stems have tip damage (usually mid-May to June).
Canola/Mustard: Diamondback moth, when larvae number more than 180/m^2.
Potato: Colorado potato beetles, tarnished plant bug, potato leafhopper - When insects first appear; repeat when necessary at 7 day intervals, except flea beetle, Colorado potato beetle at 10-15 day intervals.
Sunflowers: Sunflower beetle: Economic threshold - one to two adults/seedling or 10 to 15 larvae/plant causing 25% defoliation on the upper 8 to 12 leaves. Sunflower maggots: Economic threshold not established. Sunflower moths: Economic threshold - one to two adults/5 plants at onset of bloom.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Water Volume: Air: 9 L/ac, Potatoes: 4.5-9.0 L/ac. Ground: 45 L/ac.
Rate: Higher rate for severe infestations, adult insects, or dense foliage.

Crop	Insect	L/ac
Alfalfa	Alfalfa weevil, leafhoppers, lygus bugs, pea aphid.	0.5-0.9
Canola, mustard.	Flea beetles	0.3
	Diamondback moth, red turnip beetle.	0.4
Potato	Flea beetles	0.5
	Colorado potato beetle	0.5
	Potato leafhopper, tarnished plant bug.	0.5
Sunflower	Painted lady butterfly, sunflower maggot, sunflower moth.	0.9-1.2
	Sunflower beetle	0.4-0.9

7. **APPLICATION TIPS:** To reduce injury to bees, restrict time of application to after dark or in the early morning. Do not apply during full bloom of alfalfa. Consult with extension services to confirm weevil damage and time to spray. If damage to regrowth is evident, a stubble application is recommended. Repeated applications to potatoes may lead to excessive aphid populations, apply only when required. Coverage of sunflower heads is essential.
8. **HOW IT WORKS:** A non-systemic organophosphate insecticide. Works by contact and ingestion.
9. **EFFECTS OF RAINFALL:** Do not apply when rain is imminent. Do not apply where runoff is likely to occur.
10. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval (days): alfalfa (10), canola (30), p...toes (14), sunflowers (50). Do not harvest alfalfa for feed or hay or allow livestock to graze within 10 days of application. Do not feed or allow livestock to graze on treated canola, mustard, or sunflower.
11. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (25-54), Supracide (31-91). Toxic to bees, fish, birds, and other wildlife.
12. **PRECAUTIONS, FIRST AID:** Do not get in eyes, on skin or clothing. Wear goggles or face shield and rubber gloves when mixing. Do not inhale spray mist. Wear a respirator. Change clothing daily. Do not re-enter the treated field on day of application. A minimum 3 day re-entry period for foraging bees is necessary.
Symptoms of poisoning: Headache, dizziness, blurred vision, weakness, nausea, cramps, diarrhea, discomfort in chest, sweating, salivation, pulmonary edema, cyanosis, uncontrollable muscle twitches, loss of reflexes, convulsions, coma.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention. Do not induce vomiting unless no other treatment is available.
For Physician: Atropine is antidotal. Supracide is a cholinesterase inhibitor. Avoid aspiration and respiratory depressants.
13. **STORAGE:** Store at temperatures above 0°C. Do not use or store near heat or open flame.

TEMIK (aldicarb)

Rhône - Poulenc

1. **FORMULATIONS:** Granular; Temik 10G; 10%; 15 kg bag.
2. **MARKETING CATEGORY:** Restricted. Contact local pesticide regulatory authorities to get required permits.
3. **REGISTERED MIXES:** Compatible with most fertilizers and pesticides. Do not use with alkaline materials such as lime.
4. **CROPS:** Sugar beets.
5. **INSECTS CONTROLLED:** Sugarbeet root maggot.
6. **WHEN USED:** At planting time. Only 1 application per year.
7. **HOW TO APPLY:**
With: Ground equipment. Do not use applicators that would grind granules.
Rate:

Crop	Insect	kg/ac	g/100 m row
Sugar beets	Sugar beet root maggot	4.5	100

Incorporation:
Band Treatment: At planting, apply granules in a 20 cm wide band and work into the soil or cover with soil to a depth of 10 cm. Plant seed pieces in the treated zone.
8. **APPLICATION TIPS:** Calibrate and adjust application equipment to insure proper rate and accurate placement. Do not mix granules directly with water. Deep disc spills at row ends immediately to prevent birds from feeding on exposed granules. Do not apply to crops in bloom. Do not apply to very dry soil unless treatment is followed by irrigation.
9. **HOW IT WORKS:** Aldicarb is a soil-applied, systemic, carbamate insecticide. Soil moisture is required to release the active chemical from the granules (corn cob grits) so irrigation or rainfall should follow application. Uptake by roots is rapid; residual activity varies with dosage and pests involved but often lasts more than 6 weeks.
10. **EXPECTED RESULTS:** Active ingredient is rapidly absorbed by root systems and translocated upwards throughout all parts of the plant. Residual activity varies with dosage and pests involved, but often lasts more than 6 weeks.
11. **EFFECTS OF RAINFALL:** See "Movement In Soil".

12. **MOVEMENT IN SOIL:** The following environmental conditions, when present and in combination reduce the rate of degradation of Temik in soil and may allow movement of product residues to ground waters: Cool soil temperatures at time of application (below 10°C in root zone); heavy anticipated seasonal rainfall within 1 month after use; sandy or loamy sand soils and subsoils (field moisture holding capacity less than 15% by volume) with low organic matter (less than 1% in top 30 cm of soil); acidic subsoils (pH less than 6.0); fields that overlie shallow water tables less than 15 m deep. When all of the above conditions are met, do **not** apply. Contact Rhone-Poulenc (1-403-253-8471) if there is any question of whether your location meets these conditions.
13. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval (days): sugar beets (90). Do not harvest sugar beet tops for livestock feed within 120 days of application. Do not use tops from treated beets as food for humans. Do not use plant parts for food or feed. Do not plant food crops in soil treated with Temik for at least 1 year after treatment.
14. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (0.9). Toxic to fish, birds, and other wildlife. Birds feeding on treated areas may be killed.
15. **PRECAUTIONS, FIRST AID:** Highly flammable as a liquid. Avoid any contact with the product. Wear protective, long-sleeved clothing, goggles, pesticide respirator, and rubber gloves. After work, wash entire body with soap and water. Wash contaminated clothing and protective equipment in a strong solution of washing soda and rinse thoroughly. Extreme poisoning may cause death due to respiratory failure.
    Symptoms of poisoning: Weakness, headache, sweating, nausea, vomiting, diarrhea, tightness in chest, blurred vision, pinpoint pupils, abnormal flow of saliva, abdominal cramps, unconsciousness.
    First Aid: Contact a physician immediately in all cases. If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
    For Physician: Atropine sulphate is antidotal. Do not use opiates or cholinesterase-inhibiting drugs.
16. **STORAGE:** Do not refrigerate.
17. **DECONTAMINATION:**
    Spills on Floors: Use a sweeping compound to clean up. Decontaminate the waste with a solution of caustic soda, a strong commercial bleach and detergent. Wash floor with decontamination solution and rinse well with clean water. Clean up solution and rinse water with absorbent material such as sawdust, sweeping compound or rags.
    Spills on Ground: Treat the affected area with the decontamination solution and cover with clean soil.
    Decontamination Solution: Into 10 L of water, slowly and carefully add in sequence 130 g detergent, followed by 525 g caustic soda (lye) and finally 1.2 L of commercial bleach (sodium hypochlorite). Handle and use solution with great care. Do **not** add water to dry lye.

THIMET (phorate)

Cyanamid

DANGER POISON

1. **FORMULATIONS:** Granular; Thimet 15-G; 15%; 25 kg bag.
2. **MARKETING CATEGORY:** Restricted.
3. **CROPS:** Beans, corn, potatoes.
4. **INSECTS CONTROLLED:**

aphids	leafminer	mites
Colorado potato beetle	lygus bug	thrips
leafhopper		

5. **INSECTS SUPPRESSED:** Potato flea beetle, wireworm.
6. **WHEN USED:** One application at planting time only.
7. **HOW TO APPLY:**
    With: Granular pesticide applicator.

    Rate:

Crop	Insect	Quantity
Beans	Aphids, leafhopper, lygus bug, mites, thrips.	2.95-4.45 kg/ac
Potatoes	Aphids, leafhoppers, leafminers, reduction of potato flea beetle and wireworm damage, Colorado potato beetle (early season control).	140 g/100 m row (sandy soils) 215 g/100 m row (loams to clay soils)

8. **APPLICATION TIPS:** Beans: distribute in the row to the side of seed. Potatoes: distribute evenly in the furrow on each side of the row. Do not place in direct contact with the seed. Do not use in muck soils. Do not apply to any area not specified on the label. Do not apply later than at planting time of potatoes and beans.
9. **HOW IT WORKS:** A systemic, organophosphorus insecticide with effective initial residual activity against soil insects and other arthropods.
10. **EXPECTED RESULTS:** Only early season control of Colorado potato beetle. Reduction of potato flea beetle and wireworm damage.
11. **EFFECTS OF RAINFALL:** Relatively insoluble in water therefore the effect of normal rainfall is not appreciable.

12. **MOVEMENT IN SOIL:** Relatively insoluble therefore movement is not appreciable.
13. **GRAZING AND HARVEST RESTRICTIONS:** Do not feed foliage of treated beans within 60 days of treatment.
14. **TOXICITY:** High acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (2-4). Acute dermal LD $_{50}$ rabbits (mg/kg) = (226). Highly toxic to fish, birds, and other animals. Poisonous by skin contact, inhalation or swallowing. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning.
15. **PRECAUTIONS, FIRST AID:**
    Protective Equipment: Protective clothing, dust/ mask and rubber gloves (with cuffs over glove ends) while handling product. Do **not** handle with bare hands. Wear freshly laundered, long-sleeved work clothing daily. Clothing and gloves should be washed with soap and water after each use. Do **not** use the same gloves for other work. Destroy and replace gloves frequently. Pour downwind and allow as little free fall as possible. **Do not breath dust.** Keep all unprotected persons out of the operating areas. Do **not** get in eyes, on skin, or clothing. Wash thoroughly before eating, drinking and smoking. Bathe and change outer clothing after each work day. **Keep out of reach of children and animals.**
    Symptoms of poisoning: Weakness, headache, tightness of chest, blurred vision, nonreactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea and abdominal cramps.
    First Aid: Call a physician at once in case of suspected poisoning. In emergency endangering life or property call collect day or night 613-996-6666. **Antidote is atropine. If inhaled** remove to fresh air. If not breathing give artificial respiration, preferably mouth to mouth. If breathing is difficult, give oxygen. **If in eyes or on skin** use standard first aid measures (see page xxiii). Remove contaminated clothing and shoes. **If swallowed** seek medical attention.
    For Physician: Give atropine intramuscularly or intravenously depending on severity of poisoning, 2-4 mg every 10 minutes until fully atropinized. 20-30 mg, or more may be required during the first 24 hours. Never give opiates or phenothiazine tranquillizers or other depressants. Clear chest by postural drainage. Artificial respiration or oxygen administration may be necessary. Observe patient continously for at least 48 hours. Repeated exposure to cholinesterase inhibitors may, without warning, cause increasing susceptibility to very small doses of any cholinesterase inhibitor. Allow no further exposure to any cholinesterase inhibitor until cholinesterase regeneration has taken place. Pralidoxime chloride (2-PAM: Protopam chloride) may be effective as an adjunct to atropine. Use according to label directions.
16. **STORAGE:** Do not use or store in or around the home. Must be stored or displayed **away** from food and feed. Store open bags in labelled sealed drums or heavy plastic bags.
17. **DECONTAMINATION:**
    Procedure for decontamination of surfaces: Keep unprotected persons out of the contaminated area.
    Protective Equipment: Hat, overalls, rubber apron, rubber boots and rubber gloves. **Do not allow** product to contact eyes and skin. Launder clothing and clean protective equipment after use.
    Warning: Avoid smoking, open flames and sparks in the operating area as the decontamination procedure involves use of alcohols.
    Cover spilled granules with an absorbent material such as sweeping compound to minimize dust. Sweep up granules and place in a tightly closed labelled container. Store in a secure place. Contact Cyanamid Canada Inc. or federal authorities for details on how to detoxify product. Granules that remain in a broken bag should be transferred to a clearly marked, tightly closed alternate container. Dispose of material in accordance with provincial requirements. Wash surface with a bleach decontamination solution prepared by mixing 9 L water with 1 L commercial bleach and 0.5 L rubbing alcohol. Rinse with clean water. Clean up the liquid with absorbent material such as sawdust, sweeping compound or other materials. Repeat washing with bleach solution and water until liquid is cleaned up. Dispose of contaminated absorbent material in accordance with provincial requirements. Wash disposal equipment with bleach solution and rinse with clean water. If spill occurs on the ground, collect material and dispose as directed. Treat affected area with the decontamination solution and cover with clean soil.

THIODAN/ENDOSULFAN 400 (endosulfan)

Hoechst/United Agri Products

DANGER POISON

1. **FORMULATIONS:** Emulsifiable Concentrate; 400 g/L; 10 L container. Wettable Powder; 50%; 2 kg bag.
2. **REGISTERED MIXES:** Endosulfan is compatible with most insecticides and fungicides except Bordeaux mixture, hydrated lime, calcium arsenate, or zinc sulphate.
   Mixing Instructions: Wettable powder: fill spray tank nearly full and either pour recommended amount on water surface or pre-mix powder in a bucket 1/2 filled with water then pour mix through screen into nearly filled spray tank. Finish filling tank. Keep agitator running during filling and spraying.
3. **CROPS:**

alfalfa	clover	peas (canning)	sugar beets
beans (except lima)	corn (field, sweet)	potatoes	sunflowers

4. **INSECTS CONTROLLED:**

beet webworm	corn leaf aphid	potato aphid	sunflower beetle
black bean aphid	green peach aphid	potato flea beetle	tarnished plant bug
Colorado potato beetle	pea aphid	potato leafhopper	tuber flea beetle
corn earworm	pea weevil	spittle bug	

5. **WHEN USED:** Repeat as necessary unless directed otherwise.
Alfalfa, clover: Apply soon after spittle bug eggs hatch. Do not apply when bees are present.
Corn, peas: Do not apply more than twice per season. Apply to peas only if crop is to be harvested by combine.
Sugar beets, sunflowers: Do not apply more than once per season.
Sunflower beetle: Economic threshold - 1 to 2 adults/seedling or 10 to 15 larvae/plant causing 25% defoliation on the upper 8 to 12 leaves.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Water Volume: Thorough wetting of all plant parts is essential for good results.
Rate: Lower rate for young insects (larvae), light infestations or sparse foliage.

Crop	Insect	EC/WP	Qty/ac	Crop	Insect	EC/WP	Qty/ac
Alfalfa, clover	Spittle bugs	EC	0.3 L/ac	Potatoes	Colorado potato beetle,	EC	0.6 L/ac
Beans (except lima)	Black bean aphid, potato leafhopper	EC	0.6 L/ac		potato flea beetle, potato leafhopper, potato aphid, tuber flea beetle.	WP	0.4 kg/ac
Corn (field, sweet)	Corn earworm	EC	1.1-1.7 L/ac		Tarnished plant bug	EC	0.8 L/ac
	Corn leaf aphid	EC	1.1 L/ac			WP	0.6 kg/ac
Peas (canning)	Pea aphid, pea weevil	EC	0.6-0.8 L/ac	Sugar beets	Beet webworm	EC	1.1 L/ac
					Green peach aphid	EC	0.8 L/ac
				Sunflower	Sunflower beetle	EC	0.6 L/ac

7. **APPLICATION TIPS:** Apply during late evening. Spray upper and lower leaf surfaces. Prevent sprays or dusts from drifting to areas occupied by people or animals.
8. **HOW IT WORKS:** A non-systemic, organochloride insecticide/acaricide with both contact and stomach action.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest intervals (days): alfalfa, clover (30); beans (2); corn (50); peas (7); potatoes (0); sugar beets (45); sunflower (60). Do not feed treated crop refuse (vines, tops, stalks, threshings, sugar beet or sunflower foliage) to livestock. Sugar beet roots may be fed. Do not ensile treated corn. Do not feed fresh, dry or ensiled vines and pods of treated peas to livestock. Do not graze treated green crops except for alfalfa and clover which should not be foraged within 30 days of application.
Succeeding Crops: Do not apply to crops which are to be followed by a root crop other than carrots, potatoes, sweet potatoes, or sugar beets.
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (80-110). Toxic to bees. Highly toxic to fish. Moderately toxic to birds and mammals.
11. **PRECAUTIONS, FIRST AID:** Wear goggles, respirator, coveralls, and synthetic rubber gloves. Change clothing daily and wash before reuse.
Symptoms of poisoning: Nausea, headache, general feeling of being unwell, followed by generalized convulsion.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention for eyes immediately. **If swallowed** seek medical attention.
12. **STORAGE:** Do not store E.C. below -7°C.
13. **DECONTAMINATION:**
Spilled powder: Cover with sawdust or dirt to prevent scattering. Apply sodium carbonate, caustic soda or hydrated lime on contaminated area. After 1 hour collect and wash paved areas with water.
Spilled liquid: Decontaminate with any of above alkaline chemicals and allow to stand for 1 hour. Apply sawdust, talc, or sand to absorb all liquid. Decontaminate tools with hydrated lime. Dispose of waste in accordance with provincial requirements.
Notes to Physician: Do not give stimulants. Epinephrine or equedrine may cause ventricular fibrillation. Use an anticonvulsant.

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CHEMICAL CONTROL OF PLANT DISEASES IN ALBERTA

Introduction

Plants, like other living organisms, are attacked by many diseases that are caused by fungi, bacteria, viruses, mycoplasmas and nematodes. The management of plant diseases is based on four general parameters that include:

a) **Exclusion** or quarantine, i.e. prevention of a disease organism or diseased plant material from entering a country or disease-free area where the disease could become established;
b) **Protection** whereby proper sanitation practices, chemical controls, adequate soil nutrient levels and good soil drainage may be used to protect plants from disease organisms;
c) **Eradication** involving the use of crop rotations or the application of eradicant chemicals such as fungicides; and
d) **Plant breeding** whereby crop plants are selected for partial or complete resistance to a specific disease or range of infectious diseases.

Chemical Control of Disease

In Alberta, fungal diseases of some field crops may be subject to direct chemical control by fungicides. Control of most other field crop diseases rely on alternate methods. The major use of fungicides in these crops at present is in the treatment of seeds (cereal, forage, oilseed) and potato seed pieces. This situation may change in the near future as grain growers move to adopt more intensive crop management studies in an attempt to increase meagre profit margins.

At present foliar fungicides are registered for sclerotinia white mold control in canola, cereal leaf diseases, field beans, and foliar diseases of potatoes. For convenience, dual purpose treatments with the insecticide lindane, used in seed-treatment formulations, have been included in this chapter on fungicides. For principles and procedures involving the use of plant disease control chemicals, follow the information outlined in the first section of this guide.

AGROX D-L PLUS, FUNGICIDE - INSECTICIDE

ICI Chipman

1. **FORMULATION:**
   Seed Treatment: Powders; Agrox B-3; 11% diazinon + 16.6% lindane + 33.5% captan; 2 kg container. Agrox D-L Plus, 15% diazinon + 25% lindane + 15% captan; 50 g container.
2. **REGISTERED MIXES:** Use this product only on seed previously treated with captan or thiram. Do not use on seed already treated with an insecticide (other than methoxychlor or malathion).
3. **CROPS:** Corn, beans, peas, soybeans.
4. **FUNGI CONTROLLED:** Captan in this formulation, supplements previous fungicide treatment for seedling blight and seed rot.
5. **INSECTS CONTROLLED:** Wireworms and seed corn maggots.
6. **WHEN USED:** At planting time.
7. **HOW TO APPLY:**
   With: Protective equipment, using standard dry seed treatment methodology described. Agrox B-3 may be made into a slurry for application onto seed. Read label for specific mixing instructions.
   Drill Box Treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix product and seed thoroughly until seed is a uniform color by the following mixing method (**Do not** mix with hands):
   (a) Place and level 1/2 of the seed in drill box and sprinkle 1/2 of the required amount of product uniformly over seeds. Mix thoroughly with a paddle. Fill box with seed and sprinkle remaining 1/2 of product over seed, mix again. Thoroughly mix with a paddle when drillbox is 1/2 full and again when full.
   Rate:

Crop	Disease	Insect	Agrox B-3 mL/25 kg seed	Agrox D-L Plus mL/25 kg/seed
Corn	Seedling Blight Seed Rot	Wireworms Seed corn maggots	95	50
Beans	Seedling Blight Seed Rot	Wireworms Seed corn maggots	80	50
Peas	Seedling Blight Seed Rot	Wireworms Seed corn maggots	80	50
Soybean	Seedling Blight Seed Rot	Wireworms Seed corn maggots	80	50

8. **APPLICATION TIPS:** Treat only the amount of seed to be sown to avoid the problem of storing treated seed.
9. **HOW IT WORKS:** A protective seed treatment for the control of seedling diseases and the control of soil insects.
10. **TOXICITY:** Oral LD_{50} rats (mg/kg) = lindane (88-125), captan (8,400-15,000),diazinon (300).
11. **PRECAUTIONS, FIRST AID:**
    Protective Equipment: Wear a dust mask, goggles, long-sleeved shirt, or disposable overalls, rubber or PVC gloves, and rubber or PVC apron when handling product. Wash thoroughly after handling or before eating or smoking. Ventilate indoor working area. Do not apply or allow to drift to areas occupied by unprotected persons or to streams, lakes or ponds to protect wildlife. Avoid contamination of feed or food, including such crops on which residue is unsafe. Keep away from fire and sparks. Stored treated grain should be labelled: **Do not use for food or feed. This seed has been treated with Agrox D-L Plus. Poisonous to man and animals. Keep out of reach of children.**
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention. Take patient to nearest hospital, taking the labelled container with you.
    Toxicology: Diazinon may cause cholinesterase inhibition. Atropine is antidotal.
12. **STORAGE:** Store in cool, dry place away from food or feed. Keep container closed when not in use.

AGROX N-M, N-M DRILL BOX, DITHANE M-22 (maneb)

ICI Chipman/IPCO-Rohm and Haas

1. **FORMULATIONS:**
   Seed Treatments: Flowable; 300 g/L; Agrox Flowable; 10 L, 200 L drum. Powder; 50%; Agrox N-M; 12 X 1 kg, 4 kg bags. IPCO N-M Drill Box; 1 kg fibre can.
   Foliar Spray: Wettable Powder; 80%; Dithane M-22; 10 kg bag.
2. **REGISTERED MIXES:** With lindane as dual purpose formulations. Compatible with most insecticides and fungicides but not with Bordeaux mixture or lime.
   Mixing Instructions: Agitate Agrox Flowable thoroughly before using.
3. **CROPS:** Barley (except Palliser), flax, oats, potatoes, rye, sugar beets, wheat.

4. FUNGI CONTROLLED:

bunt (rye, wheat)	false loose smut (barley)	root rot (cereals, flax)
covered smut (barley, oats)	loose smut (oats)	seedling blight (cereals)
damping-off (flax, sugar beets)	net blotch (barley)	stinking smut (wheat)
early/late blight (potatoes)		

5. WHEN USED:

Pre-seeding or Drill Box Treatment: Treat seed before sowing. Seed should be well cured, dry, and cleaned before treatment. Do not store treated grain more than 1 year.

Potatoes: Apply early (when plants are 15 cm high) and treat at 7-10 day intervals throughout the season. Shorten interval to 5-7 days when weather favours disease.

6. HOW TO APPLY:

With: Protective equipment, using standard dry seed treatment methodology described.

Pre-seeding Treatment: Apply with any standard dry seed treatment application equipment or the shovel method.

Drill Box Treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix product and seed thoroughly until seed is a uniform colour by the following alternate mixing methods (Do **not** mix with hands):

(a) Place and level 1/2 of the seed in drill box and sprinkle 1/2 of the required amount of product uniformly over seed. Mix thoroughly with a paddle. Fill box with seed and sprinkle remaining 1/2 of product over seed, mix again. **or**

(b) Dribble the required amount of product into seed as it is poured into drill box. Thoroughly mix with a paddle when drill box is 1/2 full and again when full. **or**

(c) Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.

Water Volume: Potatoes: 325-405 L/ac; Heavy vines: 405-610 L/ac.

Rate: Potatoes: increase the rates as vines increase in size.

Crop	Disease	Powder g/25 kg seed	Flowable mL/25 kg seed
Barley (except Palliser)	Net blotch, seedling blight, smuts (covered, false loose), root rot.	50-66	85
Flax	Seedling blight, damping-off, root rot.	112	Not Registered
Oats	Seeding blight, smuts, root rot.	69-92	115
Rye	Bunt, seedling blight, root rot.	28-43	45
Wheat	Bunt or stinking smut, seedling blight, root rot.	26-40	45
Crop	**Disease**	**g/ac**	
Potatoes	Early blight, late blight.	700-910 (80% Dithane M-22)	

7. APPLICATION TIPS: Treat only the amount of seed to be sown to avoid the problem of storing treated seed. Slurry treatment not recommended for flax. Calibrate treater prior to treating seed. Use only recommended rates. Lower amounts may not give the desired control. Excessive amounts may cause seed injury.

8. HOW IT WORKS: Maneb is a fungicide, effective against many seedling and foliar diseases.

9. GRAZING AND HARVEST RESTRICTIONS: Pre-harvest interval (days): potatoes (1). Do not feed treated seed to livestock. Do not expose treated seed to birds and other wildlife.

10. TOXICITY: Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = maneb (6,750).

11. PRECAUTIONS, FIRST AID:

Protective Equipment: Wear a dust mask, goggles, long-sleeved shirt, rubber or PVC gloves and rubber or PVC apron when handling product. Wash thoroughly after handling or, before eating or smoking. Ventilate indoor working area. Do not apply or allow to drift to areas occupied by unprotected persons or to streams, lakes or ponds to protect wildlife. Avoid contamination of feed or food, including such crops on which residue is unsafe. Keep away from fire and sparks. Stored treated grain should be labelled **"Do not use for food or feed. This seed has been treated with maneb. Poisonous to man and animals." Keep out of reach of children.**

First Aid: If in eyes or **on skin** use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention. Take patient to nearest hospital taking the labelled container with you.

12. STORAGE: Store product in a cool, dry place away from food or feed. Keep away from fire and sparks. Prevent the contents from becoming wet as this will reduce effectiveness and may cause flammable vapours.

ANCHOR (carbathiin + thiram)

Uniroyal

1. FORMULATIONS: Liquid Suspension; 66.7 g/L carbathiin + 66.7 g/L thiram; 5 L container.

2. REGISTERED MIXES: Rhizobium japonicum inoculum for soybeans only.
Mix Instructions: Shake containers well prior to use.

3. CROPS: Barley, flax, oats, rye, soybeans, triticale, wheat.

4. **FUNGI CONTROLLED:**

Aspergillus storage molds (soybeans)	false loose smut (barley)	seed decay (flax, rye, triticale)
burnt (wheat)	loose smut (oats)	seed rot (soybeans)
covered smut (barley, oats)	Penicillium storage molds (soybeans)	seedling blight (soybeans, triticale)
damping-off (flax, rye, triticale)	Phomopsis seed decay (soybeans)	stem smut (rye)
Diaporthe seed decay (soybeans)	Rhizoctonia species (soybeans)	true loose smut (barley, wheat)

5. **FUNGI SUPPRESSED:** Leaf stripe (barley), net blotch (barley), root rots (barley, wheat).
6. **WHEN USED:** Apply directly to the seed in the hopper box or seed drill at planting.
   Flax: Must be treated and left to dry before seeding. If flax is treated directly in the drillbox it will be too wet to flow properly.
7. **HOW TO APPLY:**
   With: Apply directly to seed in hopper box or seed drill with premeasured amount of seed.
   Flax: Cement mixer or similar equipment. At the start, treat enough seed in a separate container to cover bottom of empty drill box. Apply the proper amount of Anchor evenly over the surface of the seed. Do **not** pour in one area. Mix with stick or paddle until all seed is of a uniform red colour. Do **not** mix with hands. Repeat this procedure until the hopper or seed drill is filled. Except for flax, seed can be planted immediately after treatment without drying.
   Water Volume: Do **not** dilute with water.
   Rate:

Crop	Disease	mL Anchor/25 kg seed
Barley	Smuts (covered, false loose, true loose), suppression of leaf stripe, net blotch, and root rots.	200
Flax	Damping-off, seed decay.	300
Oats	Smuts (covered, loose).	200
Rye	Damping-off, seed decay, stem smut.	200
Soybeans	Aspergillus and Penicillium storage molds, Diaporthe and Phomopsis seed decay, Rhizoctonia species, seedling blights, seed rot.	150
Triticale	Damping-off, seed decay, seedling blight.	200
Wheat	Smuts (stinking, true loose), suppression of root rots.	200

8. **APPLICATION TIPS:** Do not apply with commercial seed treating equipment or through an auger as excessive seed wetness may result. Stir Anchor-treated seed vigorously if the seeding has been interrupted for several hours or overnight. Seeding rate can be affected by seed treatments. Seeding rates should be checked at the beginning of the seeding operation and adjustments made accordingly. Left-over treated seed should not be stored, but should be double-sown around the headlands.
9. **HOW IT WORKS:** Carbathiin, a systemic fungicide, moves into the germinating seed to provide disease protection within the seedling. Thiram, a contact fungicide, surrounds the seed with a coat of protection from diseases that come into contact with the seed.
10. **GRAZING AND HARVEST RESTRICTIONS:** Do not use treated seed for feed, food, or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.
11. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = carbathiin (3,820), thiram (780-865), Anchor (6,370).
12. **PRECAUTIONS, FIRST AID:** Work in a well ventilated area. Wear rubber gloves and goggles. Do not consume alcohol within 24 hours before or after working with thiram; may cause flushing, sweating, headache, and nausea. Wash hands and exposed skin before eating, drinking, or smoking. **Keep out of reach of children.**
    Symptoms of poisoning: Skin contact may cause irritation and dermatitis.
    First Aid: If **in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention. If **swallowed** seek medical attention. Keep patient quiet.
13. **STORAGE:** Do not store in direct sunlight. Do not store below 0°C or over 35°C.

BAYLETON (triadimefon)

Chemagro

WARNING POISON

1. **FORMULATIONS:** Wettable Powder; 50%; 4 X 250 g PVA water soluble packets.
2. **MARKETING CATEGORY:** Restricted: Studies on the safety of this product for users and spray operators are not complete. Directions for use and precautionary statements should be followed carefully. Read the label.
3. **REGISTERED MIXES:**
   Mix Instructions: Add 1/4-1/3 required amount of water to tank, start agitation. After opening outer bag, drop the required number of unopended inner packets into tank as directed. Maintain adequate agitation prior to and during spraying.
   Mix Restrictions: Do not use PVA packets directly in diesel oils or summer spray type oils as in ULV or LV uses. Do not mix PVA packets with products that contain boron or release free chlorine because the resultant reaction is a plastic; which is not soluble in water or solvents such as diesel oils, kerosene, gasoline, or alcohol.
4. **CROPS:** Wheat (winter).

5. **FUNGI CONTROLLED:** Powdery mildew, rusts (leaf, stem, and stripe).
6. **WHEN USED:** Apply when disease symptoms first appear. Additional applications should be made if new disease symptoms appear, up to a total of 445 g/ac per crop season.
7. **HOW TO APPLY:**
   With: Ground equipment.
   Rate: 100-225 g/ac. Areas where severe powdery mildew or rust infections are expected - 160-225 g/ac may be required. Total amount must not exceed 445 g/ac per crop season.
   Water Volume: 40-120 L/ac. Use higher volume where the crop foliage is dense.
8. **APPLICATION TIPS:** Complete coverage and thorough application are essential for effective disease control, especially when lower volumes of spray are used. Use the higher rate for the most disease susceptible varieties.
9. **HOW IT WORKS:** A sterol-inhibiting fungicide with both contact and systemic action. It inhibits certain fungi from producing ergosterol. A protective, curative, and eradicant fungicide.
10. **GRAZING AND HARVEST RESTRICTIONS:** Do not apply within 60 days of harvest. Do not feed forage to cattle.
11. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = (363-568). May be fatal if swallowed. Harmful if inhaled or absorbed through skin. Causes reversible eye damage.
12. **PRECAUTIONS, FIRST AID:** Do not handle packets excessively or expose to moisture since this may cause breakage. Do not handle with wet hands. Wear protective clothing, including rubber or neoprene gloves. Wash thoroughly after use and before eating or smoking. Wash contaminated clothing before reuse. If **in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention immediately for eyes. If **swallowed** seek medical attention. **Keep out of reach of children.**
    Symptoms of poisoning: Does not cause any definite symptoms that would be diagnostic. Poisoning is accompanied by hyperactivity followed by sedation.
12. **STORAGE:** In a cool dry place but not below freezing (0°C).

BENLATE (benomyl)

DuPont

1. **FORMULATIONS:** Wettable Powder, 50%, 2 kg, 22.7 kg bags.
2. **REGISTERED MIXES:** With fungicides captan, mancozeb, thiram. Dual purpose formulations with insecticide, lindane.
   Mix Restrictions: Do not mix with alkaline pesticides such as basic copper sulphate, Bordeaux mixture, or lime sulphur. Do not tank mix or alternate Benlate with thiophanate products such as Easout.
   Mix Instructions: Add 1/2 the required water, add Benlate. Continuous agitation is required to keep material in suspension. Spray mixture should be used on the day prepared.
3. **CROPS:** Beans (dry, lima, snap), canola.
4. **FUNGI CONTROLLED:** Botrytis (beans), Sclerotinia (beans, canola).
5. **WHEN USED:** Apply only once per season.
   Beans: Between 50% and full bloom.
   Canola: During 20-30% bloom. This will usually be 4-7 days after the first blossoms appear.
6. **HOW TO APPLY:**
   With: Aircraft or Ground equipment.
   Water Volume: Beans: Air 16 L/ac. Ground 40-80 L/ac. Canola: Air 16 L/ac minimum. Ground 32-40 L/ac.
   Nozzles: Hollow cone or disc core provide more uniform coverage.
   Rate: Use the high rate under severe disease conditions.

Crop	Disease	g/ac
Beans, (dry, lima, snap)	**Botrytis** (gray mold), **Sclerotinia** (white mold).	710-910
Canola	**Sclerotinia** (stem rot)	405-605

7. **APPLICATION TIPS:** Canola: apply with high clearance boom. Repeated exclusive use of Benlate may lead to buildup of resistant strains of fungi and loss of disease control.
8. **HOW IT WORKS:** Benomyl is a protective systemic fungicide.
9. **EFFECTS OF RAINFALL:** Do not apply when rain is imminent. Do not irrigate within 6 hours of application.
10. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval (days): beans (14). Do not graze or feed treated bean hay to livestock.
11. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = technical (greater than 10,000). May irritate eyes, nose, throat and skin. Toxic to fish.
12. **PRECAUTIONS, FIRST AID:** Do not apply when weather conditions favor drift from treated areas. **Keep out of reach of children.** Avoid breathing dust or spray mist. Avoid contact with skin, eyes, and clothing. Keep away from fire or sparks.

First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention for the eyes. **If swallowed** seek medical attention.

13. **STORAGE:** Never allow product to become wet during storage as reduced fungicidal effectiveness may result. Keep container closed when not in use. Keep away from fire or sparks.

BENOLIN-R, THIRALIN-PLUS (benomyl + thiram + lindane)

Fungicide-Insecticide
IPCO/Rhône - Poulenc

1. **FORMULATIONS:** Dusts; Benolin-R; 6% benomyl + 10% thiram + 50% lindane; 1.5 kg fibre cans, 6 kg bags. Thiralin-Plus; 6% benomyl + 10% thiram + 75% lindane; 1 kg bag.
2. **CROPS:** Canola.
3. **FUNGI CONTROLLED:** Blackleg (Phoma), seedling blight, seedling decay.
4. **INSECTS CONTROLLED:** Canola flea beetles.
5. **WHEN USED:** Pre-seeding or drill box treatment.
   Benolin-R: Dry treated seed may be stored for several months. Oil dressed seed should be sown within 1 week.
   Thiralin-Plus: Treated seed may be stored up to 3 months.
6. **HOW TO APPLY:**
   With: Protective equipment, using standard dry seed treatment methodology described.
   Adhesives: Seed to be treated with Benolin-R may be first treated with canola or vegetable oil (135 mL/100 kg seed) to improve contact between seed and product. Thiralin-Plus has an added adhesive.
   Pre-seeding Treatment (preferred method): Use a commercial drum or auger, dust seed-treater or a cement mixer.
   Drill Box Treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix powder and seed thoroughly until seed is uniform colour by either of the following alternate mixing methods (Do **not** mix with hands):
   (a) fill 1/2 the drill or planter box and sprinkle 1/2 the required amount of powder over the seed. Mix with a paddle. Add enough seed to fill the box, cover with the remaining 1/2 of powder and mix again. For large boxes, it may be necessary to divide the seed into several portions. **or**
   (b) dribble the required amount of powder into each 25 kg of seed as it is poured into the drill box. Thoroughly mix with a lath or paddle when the drill box is 1/2 full and again when full.
   Rate:

Crop	Disease	Insect	Formulation	g/25 kg seed
Canola	Blackleg, seed decay, seedling blight.	Flea beetles	Benolin-R	800
			Thiralin-Plus	750

7. **APPLICATION TIPS:** Check the seed drill calibration before and during seeding operation. Clean planter plates periodically to prevent excessive build-up of chemicals. Under certain circumstances, for example, if excessive oil is added, the seed may bridge in the seed drill.
8. **HOW IT WORKS:** Benomyl is a systemic fungicide that protects against blackleg. Thiram fungicide protects against seed-borne diseases. Lindane, an organochlorine insecticide that acts by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling insects.
9. **EXPECTED RESULTS:**
   Insects: Provides protection against the above mentioned diseases and flea beetles during germination and early emergence only.
10. **GRAZING AND CROPPING RESTRICTIONS:** Do not leave treated seed exposed to birds or other animals. Do not use on soil in which edible root crops (except rutabagas and turnips) are to be planted in the same or following season.
11. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = benomyl (greater than 10,000), thiram (780-865), lindane (88-270), Thiralin-Plus (40-200). Lindane is toxic to fish, birds, and other animals. Poisonous if swallowed, inhaled or absorbed through the skin.
12. **PRECAUTIONS, FIRST AID:** Wear dust mask, goggles, rubber gloves, and protective clothing. Wash thoroughly after handling or using and before eating or smoking. Consumption of alcohol 24 hours before or after working with thiram may cause sweating, flushing and nausea. Stored seed should be labelled **"Do not use for food, feed, or oil processing. This seed has been treated with benomyl+thiram+lindane. Poisonous to man and animals." Keep out of reach of children.**
    Symptoms of poisoning: Lindane: nausea, vomiting, hyperirritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis.
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
    For Physician: Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Avoid use of morphine and adrenaline.

First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention. **For Physician:** Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Avoid use of morphine and adrenaline.

13. **STORAGE:** Do not store in the home or near food or feed. **Never** allow product to become wet during storage (this may lead to chemical changes which will reduce effectiveness of the benomyl fungicide). Keep container closed when not in use.

CAPTAN FL/CAPTAN 50W (captan)

ICI Chipman/United Agri Products

1. **FORMULATION:** Flowable; 30% liquid suspension and wettable powder 50%.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Beans (snap, dry, lima), corn (field, sweet), peas, soybeans, sugar beets.
4. **FUNGI CONTROLLED:** Seed decay, root rot, damping off and seedling blight.
5. **WHEN USED:** A seed treatment applied prior to seeding in the slurry method.
6. **HOW TO APPLY:**
   With: Protective equipment, using standard seed treatment methodology described.
   Slurry Method: Apply in slurry treater equipment with the amount of water required. Seed treated by this method should be dried before bagging.
   Rate:

Crop	Disease	30% Captan FL mL/25 kg seed
Bean, pea soybean	Seed decay, root rot, damping off, seedling blight	70
Corn - field	Seed decay, root rot, damping off, seedling blight	85
Corn - sweet	Seed decay, root rot, damping off, seedling blight	60
Sugar beet	Seed decay, root rot, damping off, seedling bright	155
Potato (seed pieces)	Brown eye disease, common scab, rhizoctonia, seed piece decay	50% Captan WP. Uses 2.5 to 3.0 kg in 1000 litre water. Dip cut potatoes in suspension, then drain. Treat within 6 hours of cutting. Dry thoroughly if planting is delayed more than 1 day.

   *This rate is to be applied only by a professional applicator to ensure complete and uniform coverage.
7. **HOW IT WORKS:** A protective seed treatment for the control of seedling diseases.
8. **GRAZING AND HARVEST RESTRICTIONS:** Do not feed treated seed to livestock. Do not expose treated seed to birds and other wildlife.
9. **TOXICITY:** Low mammalian toxicity. Captain LD_{50} = 8,400.
10. **PRECAUTIONS, FIRST AID:** Avoid breathing dust or spray mist. Wear suitable mask, goggles, and gloves. Keep away from fire or sparks. Wash thoroughly after handling and before eating, drinking, or smoking. Stored treated grain should be labelled: **Do not use for food or feed. This seed has been treated with captan.** Wash contaminated clothing with soap and hot water before wearing.
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention. Take labelled container with you.
11. **STORAGE:** In cool, dry place, away from flammable materials and sources of heat and flame and away from foodstuffs.

DITHANE M-45, MANZATE 200, TUBERSEAL (mancozeb)

Rohm and Haas/DuPont/ICI Chipman

1. **FORMULATIONS:** Wettable Powder; Dithane M-45; 80%; 20 kg bag. Manzate 200; 80%; 10 kg, 20 kg, 25 kg bags. Dust; Tuberseal; 16%; 10 kg bags.
2. **REGISTERED MIXES:** A dust may be prepared by diluting and thoroughly mixing Manzate 200 with prophylite or other neutral diluent; commonly used insecticides may displace an equivalent amount of diluent. Use dust mixtures as soon as possible after preparation. A spreader-sticker may be added to Manzate 200 in spray preparations.
3. **CROPS:** Corn, potatoes, sugar beets, wheat (durum, semi-dwarf, soft white, spring, winter).
4. **FUNGI CONTROLLED:**

cercospora leaf spot (sugar beet)	leaf rust (wheat)	septoria (wheat)
early and late blights (potato)	root rot (corn)	tan spot (wheat)
fusarium decay (potato)	seedling blight (corn)	

5. **WHEN USED:** Potato seed pieces and corn seed: treat before planting. Early and late blights in potatoes: apply when plants are 10-15 cm tall; repeat at 7-10 day intervals. Cercospora leaf spot in sugar beets: apply when disease first threatens and repeat at 7-10 day intervals. Foliar spray on wheat: apply when flag leaf has fully emerged and again 7-10 days later when the head has fully emerged.
6. **HOW TO APPLY:**
With: Potato seed duster, aircraft, ground equipment.
Water Volume: Aircraft: 16 L/ac; Ground: 40-81 L/ac; Sugar beets: 324 L/ac.
Pressure: 345 kPa.
Nozzles: Hollow cones or flat fan recommended.
Rate: Potatoes: Start with low rate and increase to maximum rate as foliage develops.

Crop	Disease	Formulation	Quantity
Corn seed	Root rot, seedling blight.	Manzate 200	0.22 kg/100 kg seed
Potato seed pieces	Fusarium decay	Tuberseal	0.5 kg/100 kg seed
		Manzate 200	1.0 kg/100 kg seed
Potatoes (foliar spray)	Early and late blight.	Dithane M-45, Manzate 200	0.44-0.90 kg/ac
Sugar beets (foliar spray)	Cercospora leaf spot	Dithane M-45, Manzate 200	0.91 kg/ac
Wheat (foliar spray)	Leaf rust, tan spot, septoria.	Dithane M-45	0.9 kg/ac

7. **APPLICATION TIPS:**
Corn Seed: Apply as dust or slurry. Treated seed should not be stored.
Potato Seed Pieces: Thoroughly coat the surface of whole or cut potato pieces. If treated whole seed is cut, make a second application. Plant as soon as possible after treating. If planting is delayed beyond 2 days after treating, seed should be air dried before bagging or loose piling.
Sprays: Continuous agitation required.
8. **HOW IT WORKS:** A protective, seed-treatment fungicide that controls fusarium decay. A contact fungicide.
9. **GRAZING AND HARVEST RESTRICTIONS:** Pre-harvest interval (days): potatoes (1), sugar beets (21), wheat (40).
10. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = mancozeb (11,200). Prolonged exposure may cause eye, nose, throat and skin irritation.
11. **PRECAUTIONS, FIRST AID:** When treating or handling treated seed, work in a well ventilated area, and wear a suitable dust mask, goggles and gloves. Treated seed should be labelled "**Do not use for food or feed. This seed has been treated with mancozeb. Poisonous to man and animals.**" **Keep out of reach of children.** Avoid contact with skin, eyes and clothing. Wash thoroughly after handling and before eating, drinking and smoking.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
12. **STORAGE:** Store in a cool, dry, ventilated place, away from fire and sparks. Do not allow product to become wet or overheated during storage as chemical changes may reduce fungicidal effectiveness and flammable vapors may be generated.

EASOUT (thiophanate-methyl)

Ciba-Geigy

1. **FORMULATIONS:** Dust; 10%; 10 kg bag.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Potatoes.
4. **FUNGI CONTROLLED:** Fusarium rot, silver scurf (**Helminthosporium solani**), verticillium wilt. Also aids in control of seed piece decay and black leg infections.
5. **WHEN USED:** Pre-plant potato seed piece treatment. Cut pieces should be treated within 6 hours of cutting. If planting is to be delayed more than 1 to 2 days, treated pieces should be stored for 2-3 days in open crates before bagging.
6. **HOW TO APPLY:**
With: Convenient container or by dust attachment over belt.
Rate: 500 grams per 100 kg of cut seed.
Water Volume: Do not add water.
7. **APPLICATION TIPS:** For optimum control of silver scurf, ensure that seed tubers are completely free of soil.
Total skin coverage of potato is essential.
Reduced control can be expected in fields where volunteers from the previous year's crop act as a source of infection. Consult your provincial specialist for recommendations.
8. **HOW IT WORKS:** A systemic and is translocated to the early seedling stage of the potato plant.
9. **EXPECTED RESULTS:** Under cool, wet conditions, Easout may improve overall emergence due to protecting the tuber and seedling from Fusarium and seed piece decay.
10. **GRAZING AND HARVEST RESTRICTIONS:** Due to the nature of the crop, this would not be applicable.
11. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (7,500), Easout (non-toxic).

12. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx). Avoid inhalation of dust. Wash hands and face after handling. **Keep out of reach of children.** Do not contaminate domestic or irrigation water supplies, lakes, streams or ponds. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
13. **STORAGE:** Store in a dry place.

FORMALIN (formaldehyde)

United Agri Products

1. **FORMULATIONS:** Solution, 37%, 4 X 4 L pack, 20 L, 205 L containers.
2. **CROPS:** Barley, oats, potatoes, wheat.
3. **FUNGI CONTROLLED:**
   - black scurf/rhizoctonia (potatoes)
   - burnt (wheat)
   - common scab (potatoes)
   - covered smut (barley, oats, wheat)
   - loose smut (oats, except hulless)
4. **WHEN USED:** Treat seed before planting. Sow treated seed as soon as possible.
5. **HOW TO APPLY:**
   With: Small sprayers or sprinklers.
   Water Volume: Barley, oats, wheat: 300 mL formalin/100 L water (= .3% solution of product).
   Grain Seed Treatment: Pile grain on floor and mix with solution until grain is wet. Cover for 4 hours or overnight. If smut balls are present, immerse grain in solution for 5 minutes. Stir and skim off smut balls.
   Potato Seed Treatment: Cold Treatment: soak uncut tubers for 2 hours. Hot Treatment: Heat solution to 49-52°C and immerse uncut tubers 3-4 minutes. Remove and cover for 1 hour. Let dry before cutting and planting.
   Rate:

Crop	Disease	mL solution*/25 kg grain
Barley	Covered smut	37
Oats	Smuts (covered, loose)	37
Wheat	Burt, covered smut	37
		mL formalin/10 L water
Potato tubers	Common scab, black scurf (rhizoctonia)	50 cold or 100 hot

   *See Water Volume for solution.
6. **HOW IT WORKS:** Formaldehyde is a bactericide and fungicide, used as a soil fumigant and seed treatment, although the latter use is limited by phytotoxicity. (1 mL solution = 1.08 g).
7. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = formaldyhyde (800). May cause irritation of skin, eyes, nose, and throat.
8. **PRECAUTIONS, FIRST AID:** Wear a gas mask and gloves. Work in a well ventilated area. Avoid prolonged or repeated contact or breathing of vapor. Keep away from heat, fire, and sparks. **Keep out of reach of children.**
   Symptoms of poisoning: Skin contact may produce irritation and dermatitis. Ingestion may cause severe abdominal pain, nausea, and vomiting, sometimes followed by stupor. Exposure to vapours may cause burning and stinging of eyes and headache.
   First Aid: If inhaled remove patient to fresh air; have the patient lie down and keep quiet and warm. Give patient egg white and milk; obtain medical attention. **If in eyes** or **on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
9. **STORAGE:** Keep containers tightly closed, away from fire and sparks. Do not freeze. Minimum storage temperature 15°C. Store in a dry, ventilated place, away from food and feed.

MERGAMMA, N-M DUAL (maneb + lindane)

Fungicide-Insecticide
ICI Chipman/IPCO

1. **FORMULATIONS:** Dusts, 37.5% maneb + 18.75% lindane: IPCO NM Dual, 1kg fibre can. Mergamma N-M, 12 X 1 kg, 4 X 4 kg packs. Suspension: 260 g/L maneb + 130 g/L lindane: Mergamma FL, 10 L, 200 L drum.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Barley (except Pelisier), oats, rye, wheat.
4. **FUNGI CONTROLLED:**
   - burnt (rye, wheat)
   - covered smut (barley, oats)
   - loose smut (oats)
   - root rot (cereals)
   - seedling blight (cereals)
   - stinking smut (wheat)

false loose smut (barley)

5. **INSECTS CONTROLLED:** Wireworms.
6. **WHEN USED:** Pre-seeding or Drill Box Treatment: treat seed before sowing. Seed should be well cured, dry, and cleaned before treatment. Do not store treated seed more than 1 year.
7. **HOW TO APPLY:**
   With: Protective equipment, using standard dry seed treatment methodology described.
   Pre-seeding Treatment: Apply by any standard dry seed treatment application equipment or by the shovel method. Treat only the amount of seed to be used to avoid the problem of storing treated seed.
   Drill Box Treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix powder and seed thoroughly until seed is a uniform colour by either of the following alternate mixing methods (Do **not** mix with hands):
   (a) Place and level 1/2 of seed in drill box and sprinkle 1/2 of required amount of product uniformly over seed. Mix thoroughly with a stick or paddle. Fill box with seed and sprinkle on remaining 1/2 of product, mix again, **or**
   (b) Dribble the required amount of product into the seed as it is poured into the drill box. Mix thoroughly with a stick or paddle when drill box is 1/2 full and again when full, or
   (c) Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.

   Rate:

Crop	Disease	Insect	Powder g/25 kg seed	Suspension mL/25 kg seed
Barley (except Pallser)	Smuts (covered, false loose), seedling blight, root rot.	Wireworms	65	100
Oats	Smuts, seedling blight, root rot.	Wireworms	42	130
Rye	Bunt, seedling blight, root rot.	Wireworms	26	84
Wheat	Bunt, stinking smut, seedling blight, root rot	Wireworms	52	78

8. **APPLICATION TIPS:** Use only recommended rates. Lower amounts may not give the desired control. Excessive amounts may cause seed injury. Avoid very deep seeding and exceptionally early sowing under poor growing conditions for maximum benefits.
9. **HOW IT WORKS:** Maneb is a protective, seed-treatment fungicide. Lindane is an organochlorine insecticide that works by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling insects.
10. **GRAZING AND HARVEST RESTRICTIONS:** Do not feed treated grain to livestock. Do not leave treated seed exposed to birds, and other wildlife.
11. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = maneb (6,750), lindane (88-270). Lindane is toxic to fish, birds, and other wildlife.
12. **PRECAUTIONS, FIRST AID:** Wear dust mask, goggles, and gloves. Work in a well ventilated area. Wash thoroughly after handling or before eating or smoking. Any treated stored grain should be labelled "**Do not use for food or feed. This seed treated with maneb+lindane. Poisonous to man and animals.**" **Keep out of reach of children.**
    Symptoms of poisoning: Lindane: may include nausea, vomiting, hyperirritability, convulsions, coma, and other symptoms typical of organochlorine insecticide poisoning. Skin contact with maneb may produce irritation or dermatitis.
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
    For Physician: Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline.
13. **STORAGE:** Do not store in or around the home, or near food or feed. Keep away from fire and sparks. **Never** allow product to become wet during storage. This may lead to chemical changes which will reduce the effectiveness of fungicide and produce flammable vapors. Keep container closed when not in use.

MERTECT (thiabendazole)

ICI Chipman

1. **FORMULATIONS:** Suspension: 46%; 4 X 4 L pack.
2. **REGISTERED MIXES:** Consult with manufacturer before mixing with other chemicals.
3. **CROPS:** Potatoes, sugar beets.
4. **FUNGI CONTROLLED: Botrytis, Fusarium, Helminthosporium, Oospora, Penicillium, Phoma, Rhizoctonia.**
5. **WHEN USED:** Once per season.
   Potatoes: Post-harvest control of storage rot in whole potatoes.
   Sugar beets: Foliage treatment for cercospora leaf spot and post-harvest control of storage rot.
6. **HOW TO APPLY:**
   With: Aircraft or Ground equipment.
   Water Volume:
   Potatoes (storage rot): 8 L Mertect/170 L water. Spray 2 L of this suspension per metric tonne of potatoes.
   Sugar beets (foliar spray): Aircraft: 4-16 L/ac. Ground: 40-202 L/ac.

Sugar beets (storage rot): Use sufficient water for complete coverage.

Rate:

Crop	Disease	Quantity
Potatoes	Storage rot	94 (suspension) mL/1000 kg potatoes
Sugar beets (foliar)	Cercospora leaf spot	162-324 mL/ac Mertect
Sugar beets	Storage rot	13 mL Mertect/1000 kg of sugar beets

7. **APPLICATION TIPS:** Do not allow suspension to stand without continuous agitation. Potatoes must rotate along the conveyor line to ensure complete coverage. Prior to treating potatoes destined for export, confirm with the proper authorities that treated potatoes will be allowed entry into the importing country.
8. **HOW IT WORKS:** Thiabendazole is a fungicide which controls **Botrytis, Fusarium, Helminthosporium, Oospora, Penicillium, Phoma, and Rhizoctonia fungi**.
9. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = thiabendazole (3,300). May cause skin irritation.
10. **PRECAUTIONS, FIRST AID:** Avoid contact with skin, eyes, and clothing. Wash hands, face, and arms after use and before eating, drinking, or smoking.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention. Product contains petroleum distillates.
11. **STORAGE:** Minimum storage temperature 0°C.

POLYRAM (metiram)

BASF

WARNING CORROSIVE

1. **FORMULATIONS:** Dry Flowable, Polyram DF; 80%; 20 kg bag. Dust; Polyram 7D; 7%; 25 kg bag.
2. **REGISTERED MIXES:** Polyram + Diazinon; 7% + 0.125%, 25 kg bag. Benlate 50W, Diazinon, Malathion. Compatible with most commonly used insecticides, adjuvants and fungicides, including Superior Oil Mixtures with Diazinon or Malathion should be prepared immediately prior to use and not allowed to stand in the tank. Open bags should be sealed if stored until the following season.
3. **CROPS:** Potatoes, Sugar beets.
4. **FUNGI CONTROLLED:**

Alternaria blight (carrots)	Early blight (potatoes,	Rust (asparagus)
Anthracnose (tomatoes)	celery, tomatoes)	Seed-borne common
Black leg (potatoes)	Fusarium seed piece decay (potatoes)	scab (potatoes)
Cercospora leaf spot (sugar beets)	Gray leaf spot (tomatoes)	Septoria leaf spot (tomatoes)
Cercospora blight (carrots)	Late blight (potatoes, celery, tomatoes)	

5. **WHEN USED:** See "How To Apply".
6. **HOW TO APPLY:**
With: Potato seed duster, aircraft, ground equipment.
Water Volume: Aircraft: 22 L/ac; Ground: 40-80 L/ac.
Pressure: 275-345 kPa.
Nozzles: Hollow cones or flat fans recommended.
Rate:

Crop/Disease	Formulation	Quantity/When To Use
Asparagus:		
Rust	Polyram DF	0.9-1.32 kg/ac after harvest when disease is first noticed; 4 applic. 7-10 day interval.
Carrot:		
Alternaria blight Cercospora blight	Polyram DF	0.9 kg/ac whenplants are 6 weeks old or when disease threatens; repeat every 7-10 days.
Celery:		
Early + late blight	Polyram DF (Polyram 7D)	0.9 (13.2) kg/ac after transplanting and repeat at weekly intervals as needed. Increase rate to 1.32 (20) kg/ac during periods of rain or heavy dew.

Rate (con't):

Crop/Disease	Formulation	Quantity/When To Use
Potato Seed Pieces:		
Black leg Fusarium decay Scab, common	Polyram 7D	1.0-1.5 kg/100 kg seed. Apply to entire surface of seed pieces after cutting. If not planted immediately, provide sufficient ventilation to allow the cut surfaces to dry. May be applied to uncut seed pieces at the same rate of control of seed-borne common scab. If treated whole seed is cut after treatment, a second application is needed to control fusarium seed piece decay and black leg.
Potato (foliar spray):		
Early + late blight	Polyram DF	At 7-10 day intervals 0.45-0.71 kg/ac until plants cover the row. Then increase to 0.9 kg/ac until tops are killed or use 0.45-0.71 kg/ac at 5-7 day intervals starting when plants are 15 cm high and continue until killing. When conditions (rain or dew) favour infections, use the shorter intervals in each case.
	Polyram 7D	11.1-13.2 kg/ac. Begin treating when plants are 15 cm high and repeat at 7-10 day intervals until tops are killed.
Sugar beets:		
Cercospora leaf spot	Polyram DF	0.91 kg/ac when disease is noticed. Repeat at 7-10 day intervals, depending on weather conditions.
Tomato:		
Early + late blight	Polyram DF (Polyram 7D)	0.91 (13.2-16.2) kg/ac when first fruit has formed and repeat at 7-10 day intervals. Apply every 7 days during weather favourable to disease or severe disease outbreak.
Anthracnose Septoria leaf spot	Polyram DF (Polyram 7D)	1.32 (12.2-22.3) kg/ac when first fruit has formed and repeat at 7 day intervals.

7. **APPLICATION TIPS:** See "How To Apply".
8. **HOW IT WORKS:** A contact and protectant fungicide.
9. **GRAZING AND HARVEST RESTRICTIONS:** Do not feed treated forage to livestock. Do not apply when environmental conditions may cause drift from the treatment area. Harvest intervals (days): carrots (5), celery (14), potatoes (1), sugarbeets (21), tomatoes (7).
10. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (greater than 10,000.)
11. **PRECAUTIONS, FIRST AID:** When treating or handling seed, work in a well ventilated area, and wear goggles, gloves, and a respirator. After handling wash with soap and water. **Keep out of reach of children. If in eyes or on skin** use standard first aid measures (see page xxiii). Get medical attention. **If swallowed** seek medical attention.
12. **STORAGE:** Store in a cool, dry, ventilated place. Do not allow product to become wet or overheated as this will reduce its effectiveness and may create flammable vapours.

PREMIERE FL (thiram+thiabendazole+lindane)

Fungicide - Insecticide
ICI Chipman

DANGER POISON

1. **FORMULATIONS:** Flowable Liquid; 4.8% thiram+1.6% thiabendazole+40% lindane; 2 X 10 L, 100 L drum.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Canola, mustard.
4. **FUNGI CONTROLLED:** Blackleg (seed-borne), seedling blight, pre-emergence damping-off and seed decay.
5. **INSECTS CONTROLLED:** Flea beetles.
6. **WHEN USED:** Treat seed once before sowing.

7. **HOW TO APPLY:** On-farm treatment with a continuous flow dripolator device or have custom treated at a seed cleaning plant.
Rate:

Crop	Disease	Insect	mL/25 kg seed
Canola	Blackleg, seedling blight	Flea beetles	700
Mustard	Seedling blight/seed decay	Flea beetles	700

8. **APPLICATION TIPS:** Roll drum or stir well before using. Ensure thorough seed coverage. Treated seed does not require drying prior to bagging or storage.
9. **HOW IT WORKS:** Thiram is a protective fungicide on the seed surface. Thiabendazole (TBZ), is a systemic fungicide which penetrates the seed to control diseases of the seed and seedling. Lindane is an insecticide that acts by ingestion, contact and to a lesser extent by fumigant action.
10. **EXPECTED RESULTS:** Prevents all above mentioned diseases from developing and protects against flea beetles during early crop emergence.
11. **MOVEMENT IN SOIL:** Does not move in the soil.
12. **GRAZING AND HARVEST RESTRICTIONS:** Do not leave treated seed exposed to birds or other animals.
13. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg)= lindane (220), thiram tech (350), thiabendazole (3,300). Lindane is toxic to fish, birds and other animals.
14. **PRECAUTIONS, FIRST AID:** Wear a suitable respirator, gloves, and coveralls. Work in a well ventilated area.
Symptoms of poisoning: Lindane: may include nausea, vomiting, hyperirritability, convulsions, coma, and other symptoms typical of organochlorine insecticide poisoning. Skin contact with fungicides may produce irritation or dermatitis.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
For Physician: Lindane is an organochlorine insecticide. Barbiturates (e.g. diazepam) may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline.
15. **STORAGE:** Do not store in the home, or near food or feed. Protect from frost (freezing).

ROVRAL (iprodione)

Rhône - Poulenc

1. **FORMULATIONS:** Wettable Powder; 50%; 1 kg, 8 kg bags. Flowable; Rovral flo; 250 g/L; 2 X 8 L pack.
2. **REGISTERED MIXES:** Addition of 405 g non-ionic wetter is recommended for improved fungicide performance with the wettable powder only.
3. **CROPS:** Beans (kidney, snap, white) (Rovral Wettable Powder only), canola.
4. **FUNGI CONTROLLED:** Botrytis diseases, sclerotinia stem rot, sclerotinia white mold.
5. **WHEN USED:**
Beans: Treatment prior to the presence of disease is preferable, however Rovral is still effective if applied at the initial sign of infection, when less than 5% of the plants are showing sclerotinia white mold. Apply when beans are in the 25-75% bloom stage.
Canola: Apply when the crop is at the 20-30% bloom stage. Infection normally occurs in July.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Water Volume: Beans 18 L/ac (air); 121 L/ac (ground). Canola 18 L/ac (air); 40 L/ac (ground).
Rate:

Crop	Disease	W.P. g/ac	Flo mL/ac
Canola	**Sclerotinia**	400-600	800-1200
Beans (white, kidney, snap)	**Sclerotinia and Botrytis**	400-600	NR

Higher rate for fields with a history of heavy disease pressure, or dense crop stands.
7. **APPLICATION TIPS:** When disease is actively growing in beans, the infection may quickly exceed the point where 5% of plants show mold. Spray mixture should be used on the day prepared. Good spray coverage is essential.
8. **HOW IT WORKS:** Rovral is a protective and eradicant fungicide.
9. **EXPECTED RESULTS:** Prevents disease infestion during the mid-flowering period and thus protects against major yield losses.
10. **EFFECTS OF RAINFALL:** Do not spray in heavy dew or when rain is imminent.
11. **GRAZING AND HARVEST RESTRICTIONS:** No restrictions on harvest provided product is applied at the recommended time.
12. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = iprodione (3,500). Very low toxicity to bees.

13. **PRECAUTIONS, FIRST AID:** As a liquid, it may be flammable. Avoid inhaling mist. A mild eye irritant. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
14. **STORAGE:** Store flowable above 0°C.

ROVRAL ST (iprodione + lindane)

Fungicide-Insecticide
Rhône - Poulenc

1. **FORMULATIONS:** Liquid Flowable; 16.7% iprodione + 50% lindane; 100 L drum or 1000 L bulk containers.
2. **REGISTERED MIXES:** Furadan CR-10 and Counter 5G may be mixed with Rovral ST treated seed. Refer to labels of both products for use recommendations and all safety precautions.
3. **CROPS:** Canola
4. **FUNGI CONTROLLED:** Blackleg (seed-borne), seedling blight caused by **Rhizoctonia solani**.
5. **INSECTS CONTROLLED:** Flea beetles
6. **WHEN USED:** Treat seed once before sowing. Do not store treated seed for more than 6 months.
7. **HOW TO APPLY:**
   With: On-farm treatment: through the auger with special equipment or with an inexpensive pump or dripolator device; or at seed cleaning plant.
   Rate:

Crop	Disease	Insect	mL/25 kg seed
Canola	Blackleg, seedling blight, **Rhizoctonia solani.**	Flea beetles	750 (suspension)

8. **APPLICATION TIPS:** Roll drum or stir well before using. Thorough seed coverage is required. Treated seed should not require drying after treatment and can be stored or bagged immediately. Treat only the required amount of seed.
9. **HOW IT WORKS:** Lindane, an organochlorine insecticide that works by ingestion, contact and to a lesser extent, by fumigant action against soil-dwelling insects. Iprodione fungicide protects against seed-borne blackleg and seedling blight caused by **Rhizoctonia solani**.
10. **EXPECTED RESULTS:**
    Diseases: Prevents the above mentioned diseases from developing.
    Insects: Protects against flea beetles for a few days after seedling emergence.
11. **MOVEMENT IN SOIL:** Does not move in the soil.
12. **GRAZING AND HARVEST RESTRICTIONS:** Do not leave treated seed exposed to birds or other animals.
13. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (200-400). Lindane is toxic to fish, birds, and other animals.
14. **PRECAUTIONS, FIRST AID:** As a liquid, it may be flammable. Wear a suitable respirator, gloves, and coveralls. Work in a well ventilated area.
    Symptoms of poisoning: Lindane: may include nausea, vomiting, hyperirritability, convulsions, coma, and other symptoms typical of organochlorine insecticide poisoning. Skin contact with fungicides may produce irritation or dermatitis.
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
    For Physician: Lindane is an organochlorine insecticide. Barbiturates (e.g. diazepam) may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline.
15. **STORAGE:** Do not store in the home, or near food or feed. Protect from frost (freezing).

THIRAM 75 WP, THIRAM 320 (thiram)

Uniroyal Chemical

1. **FORMULATIONS:** Wettable powder; 75%; 1.5 kg, 2.5 kg bag. Flowable; 32.4% thiram.
2. **REGISTERED MIXES:** None.
3. **CROPS:**
   Thiram 75WP: alfalfa, beans (dry, snap), corn (sweet), grasses, mustard, peas, soybeans, sugar beets.
   Thiram 320: Alfalfa.
4. **FUNGI CONTROLLED:** Damping-off, seed decay, seedling blight (corn, beans, grasses, mustard, peas, soybeans, sugar beets). Verticillium wilt (alfalfa).
5. **WHEN USED:** Pre-seeding or Drill Box treatment: treat seed before sowing. Seed should be well cured, dry, and cleaned before treatment.

6. **HOW TO APPLY:**
With: Protective equipment, using standard dry seed treatment methodology described.
Pre-seeding Treatment: Apply with any standard dry seed treatment application equipment or the shovel method. Drill Box Treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix product and seed thoroughly until seed is a uniform color by the following alternate mixing methods. (**Do not** mix with hands):
(a) Place and level 1/2 of the seed in drill box and sprinkle 1/2 of the required amount of product uniformly over seed. Mix thoroughly with a paddle. Fill box with seed and sprinkle remaining 1/2 of product over seed, mix again. **or**
(b) Dribble the required amount of product into seed as it is poured into drill box. Thoroughly mix with a paddle when drill box is 1/2 full and again when full. **or**
(c) Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.
Rate:

Crop	Disease	Powder (g/25 kg seed)	Thiram 320 (mL/25 kg seed)
Alfalfa	Verticillium wilt	90	180
Grasses, mustard, sugar beet	Damping-off, seed decay, seedling blight	90	-
Bean (dry, snap), pea, soybean	Damping-off, seed decay, seedling blight	25-35	-
Corn (sweet)	Damping off, seed decay, seedling blight	95	-

Water Volume for Thiram 75WP:
Slurry Treatment on alfalfa and peas: Pre-mix Thiram 75WP in water as indicated below and apply with commercial seed treating equipment.

kg Thiram 75WP	L of water	Alfalfa, kg of seed treated	Peas, kg of seed treated
1.5	5	416	1070-1498

7. **APPLICATION TIPS:** Mustard: mix powder and seed in drill box. Simultaneous treatment with an insecticide for control of flea beetles is recommended (see also the manual sections on carbofuran and terbufos).
8. **HOW IT WORKS:** Thiram is a protective fungicide applied as a foliar spray or a seed-treatment powder.
9. **GRAZING AND HARVEST RESTRICTIONS:** Do not feed treated seed to livestock. Do not expose treated seed to birds and other wildlife.
Foliar Treatment: Do not graze treated area or feed clippings from treated area.
Seed Treatment: Do not graze for 4 weeks after planting.
10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = thiram (780-865), product (800-3100). May irritate eyes, nose, throat, or skin. May cause allergenic exzema in sensitive individuals.
11. **PRECAUTIONS, FIRST AID:** Avoid breathing dust or spray mist. Wear suitable mask, goggles, and gloves. Keep away from fire and sparks. Wash thoroughly after handling and before eating, drinking, or smoking. Consumption of alcohol 24 hours before and after working with thiram or thiram-treated seed may cause sweating, flushing, and nausea. Stored treated grain should be labelled: **Do not use for food or feed. This seed has been treated with thiram. Poisonous to man and animals. Keep out of reach of children.** Wash contaminated clothing with soap and hot water before wearing.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention immediately. Take labelled container with you.
12. **STORAGE:** Store in a cool, dry, ventilated place away from food or feed. Keep away from fire or sparks.

TILT (propiconazole)

Ciba-Geigy

1. **FORMULATIONS:** Emulsifiable Concentrate; 250 g/L; 4 X 4 L jugs; 400 L farm pak.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Barley, wheat (winter, Canada prairie spring, soft white spring).
4. **FUNGI CONTROLLED:**

leaf rust (wheat)	powdery mildew (wheat)	glume blotch (wheat)	stripe rust (wheat)
net blotch (barley)	scald (barley)	stem rust (wheat)	tan spot (wheat)

5. **WHEN USED:**
Barley: Apply Tilt at the very early stages of disease development. This could occur anytime from flag leaf emergence (G.S. 37) to late boot stage (45-50) depending on environmental conditions. If little or no disease has developed prior to head emergence (G.S. 45-50), an application of Tilt should still be made at this time to protect the plant from later occurring diseases.
Wheat: Apply Tilt at the very early stages of disease development. This could occur anytime from flag leaf emergence (G.S. 37) to head half emerged (G.S. 55). If little or no disease has developed by head half emerged (G.S. 55), an application of Tilt should still be made at this time to protect the plant from later occurring diseases.
6. **HOW TO APPLY:**
With: Aircraft or Ground equipment.
Rate: 200 mL/ac.

Water Volume: 80 L/ac (ground); 16 L/ac - 20 L/ac (air).
Pressure: 275 kPa.
Nozzles: Flat fan.

7. **APPLICATION TIPS:** Good coverage is essential for effective disease control. Any reduction in water volume can reduce disease control.
8. **HOW IT WORKS:** Partially systemic, Tilt is transported upwards in plants. Tilt has both preventative and curative activity. Length of control will vary from 3-4 weeks depending on disease, crop, and environmental conditions.
9. **EFFECTS OF RAINFALL:** If rainfall occurs within 1 hour of application, reapplication is necessary.
10. **MOVEMENT IN SOIL:** Strongly absorbed to most soil. Studies show that Tilt remains in the upper layers of the soil and very little to no leaching occurs.
11. **GRAZING AND HARVEST RESTRICTIONS:** Do not feed straw from treated crops to livestock. Last application must be made prior to 45 days before harvest.
12. **TOXICITY:** Low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = technical (1,517), Tilt (2,105). Toxic to fish.
13. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page xx) and neoprene gloves. Avoid breathing spray mist or vapours. Do not eat, drink, or smoke during work. Wash hands and face thoroughly after handling. Launder contaminated working clothes before use. **Keep out of reach of children.**
Symptoms of poisoning: Irritation of eyes or skin can result from overexposure. Prolonged or repeated inhalation may cause headache, dizziness, or nausea.
First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention if irritation persists.
If swallowed seek medical attention.
For Physician: There is no specific antidote for this product.
14. **STORAGE:** Heated storage only.

VITAVAX DUAL POWDER (carbathiin + thiram + lindane)

Fungicide-Insecticide
Uniroyal Chemical

1. **FORMULATIONS:** Dusts; Vitavax dual Powder; 20.0% carbathiin + 28.9% thiram + 18.7% lindane; 1.5 kg tube.
2. **CROPS:** Barley, flax, oats, rye, wheat.
3. **FUNGI CONTROLLED:**
Barley: false loose smut, true loose smut, covered smut
Flax: seed decay, damping off
Oats: loose smut, covered smut
Rye: damping off, seed decay, skin smut
Wheat: true loose smut, bunt or stinking smut
4. **INSECTS CONTROLLED:** Wireworms.
5. **WHEN USED:** Pre-seeding or drill box treatment: treat seed before sowing. Do not store seed treated with powder.
6. **HOW TO APPLY:**
With: Protective equipment, using standard dry seed treatment methodology described.
Drill Box Treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix powder and seed thoroughly until seed is a uniform color. Do **not** mix with hands. Fill drill box to 1/2 capacity and sprinkle required amount of powder over seed. Mix with a paddle. Add seed to fill the box, cover with remaining powder and repeat. For large drill boxes, divide seed into several portions.

Rate:

Crop	Disease	Insect	Dual Powder g/25 kg seed
Barley	Smuts (covered, false loose, true loose)	Wireworms	70
Flax	Damping-off, seed decay seedling blight	Wireworms	70
Oats	Smuts (covered, loose)	Wireworms	95
Rye	Damping-off, seed decay, stem smut	Wireworms	60
Wheat	Bunt, smuts (stinking, true loose)	Wireworms	65

7. **APPLICATION TIPS:** Under-treatment results in loss of efficacy and over-treatment may reduce germination.
8. **HOW IT WORKS:** Lindane (an organochlorine insecticide) acts by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling and insect pests. Thiram, a fungicide, controls seed-borne diseases. Carbathiin, a systemic fungicide, penetrates the seed coat to control diseases of the seed and seedling.
9. **GRAZING AND HARVEST RESTRICTIONS:** Do not use treated seed for feed or food. Do not graze or feed livestock on treated areas for 4 weeks after planting.

10. **TOXICITY:** High acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = carbathiin (3,820), thiram (780-865) lindane (88-270).
11. **PRECAUTIONS, FIRST AID:** Read the label before using any product. Wear a dust mask, goggles, and rubber gloves. Consumption of alcohol 24 hours before or after working with thiram may cause sweating, flushing, headache and nausea. Label stored, treated seed with: **Do not use for food or feed. This seed has been treated with carbathiin+thiram+lindane. Poisonous to man and animals. Keep out of reach of children.**
Symptoms of poisoning: With lindane: nausea, vomiting, hyperirritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis.
First Aid: If in eyes flush immediately with running water. Get medical attention. **If on skin** wash with warm water and soap. **If swallowed** seek medical attention. Intake may cause kidney and liver damage.
12. **STORAGE:** Do not store in or around the home. Store in a dry area.

VITAVAX DUAL SOLUTION (carbathiin + lindane)

Fungicide-Insecticide
Uniroyal Chemical

1. **FORMULATIONS:** Solution; 180 g/L carbathiin + 165 g/L lindane; 4 L, 10 L, 200 L containers.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Barley, oats, wheat, rye.
4. **FUNGI CONTROLLED:**
   bunt (wheat) | covered smut (barley, oats) | false loose smut (barley
   true loose smut (barley, oats, wheat) | stem smut (rye)
5. **FUNGI SUPPRESSED:** Common root rot (barley, oats, wheat, rye), leaf strip (barley), net blotch (barley).
6. **INSECTS CONTROLLED:** Wireworms (barley, oats, wheat, rye).
7. **WHEN USED:** Pre-seeding Treatment: treat seed before sowing. Seed should be well cured, dry, and cleaned before treatment. Seed may be planted immediately after treating.
8. **HOW TO APPLY:**
   With: On-farm treatment using an auger with a pump or dripolster device or custom application at seed cleaning plants.
   Water Volume: Do not dilute with water.
   Rate:

Crop	Disease	Insect	mL/25 kg seed
Barley	Smuts (covered, false loose, true loose), suppression of common root rot, * leaf stripe,* net blotch.*	Wireworms	75-90**
Oats	Smuts (covered, loose), suppression of common root rot.*	Wireworms	75
Wheat	Bunt, true loose smut, suppression of common root rot.*	Wireworms	75-90**
Rye	Stem smut, suppression of common root rot.*	Wireworms	75

   Note:
   *Seed treatment will not protect post-seedling plants from infection.
   **For wheat and barley varieties highly susceptible to true loose smut and for high levels of smut or bunt on seed, the 90 mL rate will give increased disease control. Treated seed may give increased yields for crops growing under stress conditions such as disease, cool weather, and drought.
9. **APPLICATION TIPS:** Run auger at less than capacity to ensure adequate mixing. Uniform coverage at the correct rate is important for satisfactory results. Under treatment will result in loss of efficacy and over treatment may result in reduced germination. Calibrate seeding equipment using treated seed to ensure proper seeding rate.
10. **HOW IT WORKS:** Carbathiin, a systemic fungicide, penetrates the seed coat to control diseases of the seed and seedling. Lindane (an organochlorine) acts by ingestion, contact, and to a lesser extent, by fumigant action against many soil dwelling and phytophagous insects.
11. **GRAZING AND HARVEST RESTRICTIONS:** Do not graze or feed livestock on treated areas for 4 weeks after planting. Do not use treated seed for feed, food, or oil processing.
12. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD $_{50}$ rats (mg/kg) = Vitavax Dual Solution (1740); carbathiin (3820), lindane (88-270). Lindane is toxic to fish, birds, and other wildlife.
13. **PRECAUTIONS, FIRST AID:** Work in well ventilated area. Wear suitable mask, goggles, and butyl rubber gloves. Avoid breathing vapors. Wash all exposed areas with soap and water after use and before eating or smoking. Do not reuse bags or augers used for treated seed. Label stored treated seed **"Do not use for food, feed, or oil processing. This seed has been treated with carbathiin + lindane. Poisonous to man and animals." Keep out of reach of children.**
Symptoms of poisoning: Apprehension, twitching, tremors, and convulsions.

First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). Get medical attention for eyes. **If swallowed** seek medical attention. Take labelled container with you.
For Physician: There is no specific antidote. If swallowed, **intubate** the stomach. Treat as solid organochlorine pesticide poisoning. Diazepam is the anticonvulsant of choice.

14. **STORAGE:** Do not store below 0°C.

VITAVAX POWDER (carbathiin + thiram)

Uniroyal Chemical

WARNING POISON

1. **FORMULATIONS:** Dust; 26.7% carbathiin + 38.6% thiram; 1.5 kg tube.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Barley, flax, oats, rye, soybeans, wheat.
4. **FUNGI CONTROLLED:**

bunt (wheat)	damping-off (flax, rye, soybeans)	stem smut (rye)
covered smut (barley, oats)	seed decay (flax, rye, soybeans)	true loose smut (barley, oats, wheat)

5. **WHEN USED:** Drill Box Treatment: treat seed before sowing. Seed should be well cured, dry, and cleaned before treatment. Do not store treated seed.
6. **HOW TO APPLY:**
With: Protective equipment, using standard dry seed treatment methodology described.
Pre-seeding Treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix product and seed thoroughly until seed is a uniform colour with a stick or paddle. Do **not** mix with hands. Fill the drill or planter box to 1/2 capacity and sprinkle 1/2 the required amount of powder over the seed and mix thoroughly. Seed should all be pink. Then add enough seed to fill the box, cover with the remaining powder and repeat mixing procedure. For large drill or planter boxes, it may be necessary to divide the seed into several portions. Clean planter plates periodically to prevent excessive build-up of treatment chemicals.
Rate:

Crop	Disease	g powder/25 kg seed
Barley	Smuts (covered, false loose, true loose)	50
Flax	Damping-off, seed decay, seedling blight.	60
Oats	Smuts (covered, loose)	70
Rye	Damping-off, seed decay, stem smut.	45
Soybeans	Damping-off, seed decay.	65
Wheat	Bunt	40
	Smuts (true loose)	55

7. **APPLICATION TIPS:** Vitavax Powder has no vapor action, therefore thorough seed coverage is required. Seeding rate should be checked before planting and periodically during planting.
8. **HOW IT WORKS:** Thiram is a fungicide which controls diseases carried on the seed. Carbathiin is a systemic fungicide which penetrates the seed coat to control diseases inside the seed and seedling.
9. **GRAZING AND HARVEST RESTRICTIONS:** Do not use treated seed for feed, food, or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.
10. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) - carbathiin : thiram (1,600).
11. **PRECAUTIONS, FIRST AID:** Read the label before using any product. Work in well ventilated area and wear a dust mask, goggles and gloves. Do not consume alcohol within 24 hours before or after working with thiram, may cause flushing, sweating, headache, and nausea. **Keep out of reach of children.**
Symptoms of poisoning: Skin contact may result in irritation and dermatitis.
First Aid: If in eyes flush immediately with running water. Get medical attention. **If on skin** wash with warm water and pumice soap to remove dye. **If swallowed** seek medical attention. Keep patient quiet. Get medical attention immediately. Intake may cause kidney, liver and nervous system damage. In severe cases a coma may result.
12. **STORAGE:** Do not store product in or around the home or near food or feed. Store powder in a dry area.

VITAVAX RS FLOWABLE, VITAVAX RS POWDER

(carbathiin + thiram + lindane)
Fungicide-Insecticide
Uniroyal Chemical

DANGER POISON

1. **FORMULATIONS:** Vitavax rs Powder: 3.3% carbathiin + 6.7% thiram + 50.0% lindane; 1.5 kg tube. Suspension: Vitavax rs Flowable; 45 g/L carbathiin + 90 g/L thiram + 680 g/L lindane; 4 L, 10L, 100 L containers.
2. **CROPS:** Canola, mustard, cole crops (cabbage, cauliflower, broccoli, rutabaga, brussel sprouts).
3. **FUNGI CONTROLLED:** blackleg (seed borne), seed decay, seedling blight.
4. **INSECTS CONTROLLED:** Flea beetles.
5. **WHEN USED:** Pre-seeding or drill box treatment: treat seed before sowing. Seed should be well cured, dry and cleaned before treatment. Do not store seed treated with powder. Seed treated with flowable should be tested for germination before planting if stored for more than 9 months.
6. **HOW TO APPLY:**
   With: Protective equipment, using standard dry seed treatment methodology described. Seed-dressing equipment for liquid formulations. Clean planter plates periodically to prevent excessive buildup of chemicals with powder.
   Pre-seeding Treatment: Flowable can be applied in a continuous treating operation with S-Series Treaters or OFT Treaters (Uniroyal Chemical), batch treaters, or cement mixers.
   Powder Drill Box Treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix powder and seed thoroughly until seed is a uniform color. Do **not** mix with hands. Fill drill box to 1/2 capacity and sprinkle required amount of powder over seed. Mix with a paddle. Add seed to fill the box, cover with remaining powder and repeat. For large drill boxes, divide seed into several portions.
   Rate:

Crop	Disease	Insect	RS Powder g/ kg seed	RS Flowable mL/25 kg seed
Canola, mustard	Blackleg, seed decay, seedling blight	Flea beetles	30	562
Cole crops	Blackleg, seed decay, seedling blight	Flea beetles	31	

7. **APPLICATION TIPS:** Vitavax rs Flowable: Important that seed and chemical are mixed quickly and uniformly. Prior to and during treatment, flowable product should be kept at about 10°C for best results. Under-treatment results in loss of efficacy and over-treatment may reduce germination.
8. **HOW IT WORKS:** Lindane (an organochlorine insecticide) acts by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling and insect pests. Thiram, a fungicide, controls seed-borne diseases. Carbathiin, a systemic fungicide, penetrates the seed coat to control diseases of the seed and seedling.
9. **EXPECTED RESULTS:** Diseases: Controls the diseases listed. Protects against flea beetles for a few days after crop emergence.
10. **GRAZING AND HARVEST RESTRICTIONS:** Do not use treated seed for feed, food or oil processing. Do not leave treated seed exposed to birds or animals.
11. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = Vitavax rs (302), carbathiin (3,820), thiram (780-865), lindane (88-270).
12. **PRECAUTIONS, FIRST AID:** Read the label before using any product. Work in a well-ventilated area and wear a dust mask, goggles, and rubber gloves. Consumption of alcohol 24 hours before or after working with thiram may cause sweating, flushing, headache and nausea. Label stored, treated seed with: **Do not use for food, feed or oil-processing. This seed has been treated with carbathiin+thiram+lindane. Poisonous to man and animals. Keep out of reach of children.**
    Symptoms of poisoning: With lindane: nausea, vomiting, hyperirritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis.
    First Aid: If in eyes flush immediately with running water. Get medical attention. **If on skin** wash with warm water and soap. **If swallowed** seek medical attention immediately.
13. **STORAGE:** Do not store in or around the home. Store powder in a dry area. Do not store Vitavax rs Flowable at temperatures below 0°C or exceeding 25°C.

VITAVAX SINGLE SOLUTION (carbathiin)

Uniroyal Chemical

1. **FORMULATIONS:** Solution; 230 g/L; 4 L, 10 L, 200 L containers.
2. **REGISTERED MIXES:** None.
3. **CROPS:** Barley, flax, oats, rye, wheat.
4. **FUNGI CONTROLLED:**

bunt (wheat)	false loose smut (barley)	stem smut (rye)
covered smut (barley, oats)	seed decay (flax)	true loose smut (barley, wheat)
damping-off (flax)	loose smut (oats)	

5. **WHEN USED:** A ready-to-apply formulation for commercial treaters and on-farm auger treating. Chemical is added directly to the seed as it enters the mixing chamber or auger. Seed may be planted immediately.
6. **FUNGI SUPPRESSED:** Common root rot (barley, oats, rye, wheat), leaf stripe (barley), net blotch (barley).
7. **HOW TO APPLY:**
   With: On-farm treatment: through the auger with special equipment or with an inexpensive pump or dripolator device; or at seed cleaning plant.
   Water Volume: Do **not** dilute with water.
   Rate:

Crop	Disease	mL/25 kg seed
Barley	Smuts (covered, false loose, true loose), suppression of common root rot,* leaf stripe,* net blotch.*	60-75**
Flax	Damping-off, seed decay.	100
Oats	Smuts (covered, loose), suppression of common root rot.*	60
Rye	Stem smut, suppression of common root rot.*	60
Wheat	Bunt, true loose smut, suppression of common root rot.*	60-75**

   *Seed treatment will not protect post-seedling plants from infection.
   **For wheat and barley varieties highly susceptible to true loose smut and for high levels of smut or bunt on seed, the 75 mL rate will give increased disease control. Treated seed will give increased yields for crops growing under stress conditions such as disease, cool weather and drought.
8. **APPLICATION TIPS:** Run auger at less than capacity to provide adequate mixing. Uniform coverage at the correct rate is important for satisfactory results. Under treatment results in loss of efficacy and over treatment may reduce germination. Calibrate seeding equipment using treated seed to ensure proper seeding rate.
9. **HOW IT WORKS:** Carbathiin a systemic fungicide, penetrates the seed coat to control disease.
10. **GRAZING AND HARVEST RESTRICTIONS:** Treated seed not to be used for food, feed, or oil processing. Do not graze feed livestock on treated areas for 4 weeks after planting.
11. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = carbathiin (3,820).
12. **PRECAUTIONS, FIRST AID:** Read the label before using any product. Work in a well ventilated area. When treating seed, augering or handling treated seed, wear a dust mask, goggles, and butyl rubber gloves. Do not get in eyes or on skin. Avoid breathing vapours. Do not reuse bags from treated seed or auger used for treated seed for other purposes. Label stored treated seed **"Do not use for food, feed, or oil processing. This seed has been treated with carbathiin." Keep out of reach of children.**
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
13. **STORAGE:** Store above 0°C. Do not store in or around the home.

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CHEMICAL CONTROL OF RODENTS IN ALBERTA

Introduction

Rodent problems are usually related to human cultural practises. Understanding how to modify certain activities or situations will help prevent or reduce problems with rodents. For example, pastures should not be overgrazed as this encourages proliferation of ground squirrels. Mouse problems can be prevented or drastically reduced, especially in buildings, by eliminating their food source and areas of shelter. Rotational cropping will prevent establishment of high pocket gopher numbers. However, not all rodent problems can be corrected by management or cultural changes.

Chemical control, combined with management and cultural modifications, is usually required to eliminate established rodent populations and prevent recurrence.

This section contains information on chemicals used to control or repel ground hogs, ground squirrels, mice, pocket gophers, and rabbits in Alberta.

ANTICOAGULANTS

[bromodialone, chlorophacinone, diphacinone, warfarin, warfarin+sulfaquinoxaline]

Numerous Manufacturers

[brodifacoum (Chipman/Wilson)], [warfarin+ergocalciferol (Ciba-Geigy)]

DANGER POISON

1. FORMULATIONS:

Formulation	Active Ingredient (AI)	Concentration (AI)	Container Sizes
Bait block	Brodifacoum, bromodialone, chlorophacinone, diphacinone.	0.005%	50 g to 9 kg
Dust or powder	Warfarin	0.5%	100 g
Extruded pellets	Brodifacoum, bromodialone, chlorophacinone, diphacinone	0.005%	50 g to 20 kg
"	Pindone, Warfarin	0.025%	50 g to 9 kg
"	Warfarin+sulfaquinoxaline	0.025% + 0.025%	500 g to 1 kg
Particulate	Bromodialone, chlorophacinone.	0.005%	20 g to 20 kg
"	Warfarin, Pindone	0.025%	454 g to 20 kg
"	Warfarin+calciferol	0.025% + 0.1%	500 g, 10 kg
"	Warfarin+sulfaquinoxaline	0.025% + 0.025%	500 g to 10 kg
Soluble granules	Warfarin	0.5%	11.3 g
Solution	Chlorophacinone	0.28%, 0.7%	1 L, 4 X 1 L pack

2. REGISTERED MIXES: Use as directed on container label. Brodifacoum and bromodialone are single-feeding anticoagulants; all others are multiple-feeding anticoagulants.

3. REGISTERED USES:

	Products							
	Chlorophacinone	Diphacinone	Warfarin (W)	W+Calciferol	W+Sulfaquinoxaline	Brodifacoum	Bromodialone	Pindone
MICE AND VOLES:								
Farm buildings	X	X	X	X	X	X	X	X
Food service areas	X	X	X	X	X		X	
Fruit trees, ornamentals, vines	X	X	X		X			
Garbage dumps	X	X	X		X	X	X	
Granaries (empty)	X	X	X	X	X	X		X
Human dwellings	X	X	X	X	X	X	X	X
Nurseries	X	X			X			
Orchards	X	X			X			
Storage buildings	X	X	X	X	X	X	X	X
Outdoor living areas (parks, playgrounds)	X				X			
Sewers		X	X				X	
Woodlands	X	X						

Ground Squirrels: Chlorophacinone and diphacinone in farmyards, pasture/rangeland, forage/field crops, gardens, nurseries, turf, residential areas.

4. ANIMALS CONTROLLED: Ground squirrels, mice, voles (field mice).

5. WHEN USED:

Ground squirrels: Best results when used prior to spring vegetation regrowth.

Mice, Voles: Best results when used after removal of other food sources.

6. HOW TO APPLY:

With: Hand application to bait stations or burrows.

Rate:

Bait Station	Animal	Formulation
500 g/station every 30-60 m of infested area depending on animal density	Ground squirrel	Pellets, liquid concentrate on grain
15-50 g/protected station at intervals of 2-3 m	Mice, Voles	Meal, pellets, dust/powder, liquid concentrate
1 or 2 blocks/station at intervals of 2-3 m	Mice, Voles	Bait blocks
One 11.3 g packet/L of water in chick fountain or shallow dish near feeding sites	Mice	Soluble granules
Pour 100 mL of solution into shallow dish near feeding sites	Mice	Solution
Burrows		
15-20 g/burrow	Ground squirrel	Pellets, liquid concentrate on grain

Number of Applications: Brodifacoum and bromadiolone: 1 usually effective. Can be re-applied after 1 week if mice still present. All other anticoagulants: maintain uninterrupted supply of bait until feeding ceases.

7. **APPLICATION TIPS:**
   Bait Station: Place bait in inaccessible areas in secure bait stations that cannot be turned over or broken into by children, pets, or wild or domestic animals. For best results, apply bait for ground squirrels before "green-up" of spring vegetation.
   Burrows: Place bait far into burrow with long spoon. This makes it inaccessible to non-target animals.
8. **HOW THEY WORK:**
   Anticoagulant rodent poisons: interfere with clotting of blood and cause damage to tiny blood vessels. They prevent formation of prothrombin by competition with vitamin K. Rate of blood clotting is gradually reduced and the animal bleeds to death.
   Calciferol: mobilizes calcium and causes death from organ calcification and heart attack.
   Sulfaquinoxaline: is an antibacterial agent that increases the effectiveness of warfarin by inhibiting intestinal bacteria that produce vitamin K.
9. **EXPECTED RESULTS:** Rodents usually begin to die 3 to 4 days after they ingest anticoagulants.
10. **EFFECTS OF RAINFALL:** Can result in deterioration and molding of exposed bait. Extended rainfall will also effect field rodent activities, reducing bait uptake.
11. **MOVEMENT IN SOIL:** Negligible at recommended rates.
12. **GRAZING AND CROPPING RESTRICTIONS:** Do not use ground squirrel bait stations in areas accessible to livestock or pets.
13. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = brodifacoum (0.27), bromadiolone (1.12), chlorophacinone (5.0), diphacinone (2.3), warfarin (50-100). Potentially toxic to birds and other animals.
14. **PRECAUTIONS, FIRST AID:** Wear gloves. Wash hands after use. Label bait stations **"Poison". Keep out of reach of children.**
    Symptoms of poisoning: Pallor and weakness from blood loss, bloody nose and feces, internal bleeding, swelling and discolouration from blood in tissue. **If in eyes or on skin** use standard first aid measures (see page xxxi). **If swallowed** seek medical attention.
15. **STORAGE:** Store in locked room or container. Do not store with other pesticides or chemicals; rodents are repelled by contaminated bait. Keep bait in original container.

GASEOUS OXIDES OF SULPHUR (gas cartridges)

Dexol Sonex

DANGER POISON

1. **FORMULATIONS:** Granular solid within cardboard cylinder; major ingredients - sodium nitrate, charcoal, sulphur (contains various components depending on manufacturer); 75-85 g/cylinder, 3 cylinder package.
2. **REGISTERED MIXES:** None.
3. **REGISTERED USES:** Farmyards, forage/field crops, gardens, nurseries, orchards, outdoor living areas, pasture/rangeland, residential areas*, turf.
   *Populated areas, such as cities and large campgrounds.
4. **ANIMALS CONTROLLED:** Woodchucks, ground squirrels, pocket gophers.
5. **WHEN USED:** Spring through fall when rodents are active and causing damage.
6. **HOW TO APPLY:** Place fuse in a sulphur oxide cartridge, light fuse and insert cartridge as far as possible into rodent burrow. When cartridge begins to burn, plug burrow with soil to prevent smoke from escaping.
   Rate: 1 cartridge/rodent burrow is usually sufficient.
7. **APPLICATION TIPS:** During gasing operation, watch for smoke exiting nearby burrows and plug these also.
8. **HOW IT WORKS:** As a cartridge ignites, smoke and toxic gases are produced and fill the rodents' burrow. Rodents breathe toxic fumes and are asphyxiated.

9. **EXPECTED RESULTS:** Asphyxiation of rodents in treated burrows. **Poor results may be expected** if cartridges are used to control pocket gophers and ground squirrels that have well established burrow systems. All areas of an extensive burrow system will not be penetrated by toxic gases from a cartridge. These areas provide a retreat for inhabiting rodents.
10. **EFFECTS OF RAINFALL:** None.
11. **MOVEMENT IN SOIL:** None.
12. **GRAZING AND CROPPING RESTRICTIONS:** None.
13. **TOXICITY:** High acute mammalian toxicity in enclosed area. 1000 mg/kg of carbon monoxide, a major product of combustion, causes death.
14. **PRECAUTIONS, FIRST AID:** Wear gloves. Avoid prolonged breathing of fumes. Do not use under wooden buildings or flammable material. **Keep out of reach of children.**
Symptoms of poisoning: Same as carbon monoxide. Tightness across forehead, headache, throbbing at the temples, dizziness, weariness, nausea, vomiting, collapse, and unconsciousness. **If inhaled** remove victim to fresh air and keep him lying down. If breathing has stopped, apply artificial respiration. Get medical attention promptly.
15. **STORAGE:** Store in cool, dry place as cartridges will absorb water. Keep [illegible] lock and key away from combustion source.

HINDER (ammonium soaps of higher fatty acids)

Uniroyal

1. **FORMULATIONS:** Liquid. 19.0%. 3.75 L bottle. 15 L carton of 4 bottles.
2. **REGISTERED MIXES:** Do not apply with any other additives or pesticides.
3. **REGISTERED USES:** Fruit trees, blueberries, raspberries and vines, vegetable and field crops and strawberries, ornamentals, nursery stock, forage crops, grain crops and non-crop areas.
4. **ANIMALS CONTROLLED:** Rabbits and hares.
5. **WHEN USED:** Can be applied during all seasons. **Do not apply to food crops within 14 days of harvest.**
6. **HOW TO APPLY:** Add product to water at rate prescribed on label and apply by spraying equipment or paint onto trunks of shrubs and trees.
7. **APPLICATION TIPS:** For best results, apply before rabbits or hares begin to feed on crop and when weather is clear and dry. Length of protection affected by application rate, rainfall, and feeding pressure. In winter, apply on warmer days. Up to three applications may be required for full winter protection. Increase height of application on trunks and branches of trees and shrubs if deep snow is anticipated. Re-application may be required after heavy rainfall. Re-apply if renewed damage occurs.
8. **HOW IT WORKS:** An odor repellant. Rabbits are deterred from eating treated vegetation by the odor of the product.
9. **EXPECTED RESULTS:** Prevention or control of rabbit damage to vegetation.
10. **EFFECTS OF RAINFALL:** Do not apply when raining or if rain is forecast. Heavy rain will wash product off treated vegetation.
11. **MOVEMENT IN SOIL:** None.
12. **GRAZING AND CROPPING RESTRICTIONS:** Do not apply to food crops within 14 days of harvest.
13. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD su rats (mg/kg) = (greater than 5000 mg/kg). Non-toxic to plant and animal life.
14. **PRECAUTIONS, FIRST AID:** May cause severe irritation to eyes, skin and respiratory tract. Wear impervious rubber gloves. Wear goggles, safety shield or safety glasses. Wash hands after use. Do not eat or smoke during use. **Keep out of reach of children. If in eyes** flush with plenty of water for at least 15 minutes and get medical attention. **If on skin** wash thoroughly with soap and water. If skin irritation develops or persists seek medical attention.
Symptoms of poisoning: Unknown. **If swallowed** seek medical attention.
15. **STORAGE:** Store in a cool, dry, well-ventilated area away from sources of ignition and incompatible products. Do not store near food, feed or fertilizers. Keep product in original containers. Keep under lock and key.

QUINTOX, RAMPAGE [cholecalciferol (Vitamin D3)]

Cev/Bell

1. **FORMULATIONS:** Extruded Pellets: 0.075%; 50 X 30 g place pack, 8 X 30 g boxes, 5.5 lb pail. Treated Seed: 0.075%; 10 g place packs, 5 lb pail.
2. **MARKETING CATEGORY:** Commercial.
3. **REGISTERED MIXES:** Use as directed on container label.
4. **REGISTERED USES:** Dwellings, farm buildings, grainary bins (empty), processing plants (non-food), storage areas (non-food), service establishments (non-food).
5. **ANIMALS CONTROLLED:** Mice, voles (meadow mice).
6. **WHEN USED:** Any time of year.
   Number of applications: Maintain uninterrupted supply of bait until feeding ceases. If reinfestation occurs, repeat treatment. If a continuous problem exists, establish permanent bait stations and replenish bait as required.
7. **HOW TO APPLY:** Place 1 bait pack at 2-3 m intervals in infested area or place up to 20 g in covered bait stations at 2-3 m intervals in the problem area.
8. **APPLICATION TIPS:** Remove alternative food sources and any potential living areas of mice as best as possible prior to bait use. Place bait where mice will find it such as along walls, near gnawed openings or beside burrows, or generally where mice or their signs (i.e. droppings, tracks) are noticed. Protect bait from rain, snow, or other moisture. Replace old, stale bait.
9. **HOW IT WORKS:** Cholecalciferol mobilizes calcium from the bones of affected rodents into the bloodstream. This action causes hypercalcemia and death from heart failure. Feeding stops once a lethal dose is consumed. Less than 3 g of consumed bait is sufficient to kill a mouse.
10. **EXPECTED RESULTS:** A lethal dose can be consumed by a mouse in one feeding but usually this occurs after several smaller feedings over several days. Death results 2 to 4 days after a lethal dose is consumed.
11. **EFFECTS OF RAINFALL:** Rain, snow, or other moisture will cause deterioration and moulding of bait and result in poor bait acceptance by mice.
12. **MOVEMENT IN SOIL:** Negligible at recommended rates.
13. **GRAZING AND CROPPING RESTRICTIONS:** None if applied properly at recommended rates.
14. **TOXICITY:** High mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = 100% concentration (43.6 mg/kg). Low dermal and oral toxicity for birds. No secondary hazards exist.
15. **PRECAUTIONS, FIRST AID:** Wear gloves. Wash hands after use. Label bait stations **"Poison". Keep out of reach of children, domestic animals, and pets.**
    Symptoms of poisoning: Hypercalcemia. **If in eyes or on skin** use standard first aid measures (see page xiii). **If swallowed** seek medical attention.
16. **STORAGE:** Store under lock and key, in original containers. Do not store with other pesticides or chemicals; rodents are repelled by contaminated bait.

RO-PEL

[benzyldiethyl (2,6 xylyl carbamoyl) methyl ammonium saccharide]

Burlington

1. **FORMULATIONS:** Liquid; 0.065%; 946 mL spray bottle, 3.78 L bottles, 18.9 L, 207.8 L drums.
2. **REGISTERED MIXES:** Never mix with other chemicals. Use full strength.
3. **REGISTERED USES:** Nursery stock, ornamentals.
4. **ANIMALS CONTROLLED:** Mice and voles, porcupines, rabbits and hares, beaver, ground squirrels, woodchucks.
5. **WHEN USED:** Spring to fall. Before damage is caused or to prevent further damage. A second application may be necessary on new vegetation growth.
6. **HOW TO APPLY:** Apply to areas of damage or on areas normally damaged by rodents. **Do not apply to edible parts of trees or plants.**
   With: Brush or Sprayer.
   Rate: Generously apply to all surfaces to be protected until completely wet. Apply second coat for extra protection.
7. **APPLICATION TIPS:** Allow first treatment to dry before reapplying. Do not apply on windy or rainy days. Application on dry surfaces is preferable. Although this product is not toxic to plants or trees, do not use on diseased specimens.
8. **HOW IT WORKS:** A taste repellant. Attempts by rodents to eat or chew on treated areas results in a bitter taste.

9. **EXPECTED RESULTS:** Prevention of rodent damage to treated areas of plants. **Poor results may be expected if** plants improperly treated or improper amount applied.
10. **EFFECTS OF RAINFALL:** Do not apply when raining or if rain is forecast. Rain will wash product from treated areas.
11. **MOVEMENT IN SOIL:** None.
12. **GRAZING AND CROPPING RESTRICTIONS:** Do not apply to edible parts of crops or plants, fruit, or nuts.
13. **TOXICITY:** Very low acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (greater than 1,500). Non-toxic to plant and animal life.
14. **PRECAUTIONS, FIRST AID:** Avoid contact with eyes, skin, food, and clothing. Wear impervious rubber gloves. Wash hands after use. Do not smoke or eat while applying. **Keep out of reach of children. If in eyes** flush with plenty of water for at least 15 minutes and get medical attention. **If on skin** wash first with isoropyl or ethyl alcohol, then soap and water. If an irritation develops and persists, get medical attention.
Symptoms of poisoning: Unknown. **If swallowed** seek medical attention.
15. **STORAGE:** Store in cool, dry area, under lock and key. Do not store near food, feed or fertilizers. Keep product in original container.

STRYCHNINE

Elston/Rhône - Poulenc/Sanex/Savolite

DANGER POISON

1. **FORMULATIONS:** Pellet; 0.35%; 454 g jar, 2.27 kg bag, 18.2 kg bag. Liquid Concentrate; 2%; 250 mL container, 36 X 250 mL pack.
2. **MARKETING CATEGORY:** Restricted. A record of the user's name, address, land location and signature must be kept by distributors.
3. **REGISTERED MIXES:** Use according to label.
4. **REGISTERED USES:** Forage/field crops, pasture/rangeland.
5. **ANIMALS CONTROLLED:** Ground squirrels, pocket gophers.
6. **WHEN USED:** Best control for ground squirrels when used in early spring prior to vegetation regrowth. Apply for pocket gophers in early spring prior to vegetation regrowth or in fall.
Number of applications:
Ground squirrel: 1 application often effective. Rebait active burrows after 5 days.
Pocket gopher: Rebait active burrows 10-14 days after initial treatment. If burrow builder used for first treatment, hand baiting should be used for followup. Use traps for final clean-up.
Rate: Add 250 mL can of 2% liquid concentrate to 4 L of quality oat groats or wheat, or diced carrots for pocket gophers. Mix well. Place 5 mL of bait into each burrow. When using burrow builder for pocket gophers use about 1.1 L of grain bait/ac.
7. **APPLICATION TIPS:**
Ground squirrel: Place bait far into burrow with long spoon to prevent non-target poisoning. Pick up dead rodents to prevent poisoning of scavenging animals.
Pocket gopher: Hand baiting; use commercial probe or metal bar to locate burrow. Seal each probe hole after bait is put in. Tractor-drawn burrow builder; follow machine use instructions.
8. **HOW IT WORKS:** Enters the blood and acts on the central nervous system. Symptoms appear from 5-30 minutes after ingestion. Convulsions lead to death from respiratory failure.
9. **EXPECTED RESULTS:** Reduction or elimination of rodents in control area. **Poor results may occur if** baiting is conducted in summer after vegetation growth has established. Bait acceptance is poor at this time. Poor quality grain and poorly mixed bait will also effect results.
10. **EFFECTS OF RAINFALL:** None if applied correctly within burrows.
11. **MOVEMENT IN SOIL:** None at recommended rates.
12. **GRAZING AND CROPPING RESTRICTIONS:** None if used as directed and no bait is spilled or remains above ground.
13. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (12 mg/kg). Lethal dose to man 30-60 mg/kg. Toxic to birds, cattle, and other animals.
14. **PRECAUTIONS, FIRST AID:** Wear gloves. Wash hands after use. Use care when opening cans of liquid concentrate. Label bait container **"Poisonous to man and animals. This bait contains strychnine." Keep out of reach of children.**
Symptoms of poisoning: Frequent convulsions with intervals of quiescent periods. Body stiffens and arches, breathing stops. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
15. **STORAGE:** Keep bait in sealed, well marked containers prior to use or when stored. Keep under lock and key. Do not freeze.

THIRAM

ICI Chipman/Wilson

WARNING POISON

1. **FORMULATIONS:** 120 g/L suspension; 12 x 500 mL bottle, 4 x 4 L case, 4 L container.
2. **REGISTERED MIXES:** Use as directed. Do not mix with other pesticides.
3. **REGISTERED USES:** Fruit trees, nursery stock, orchards, woody ornamentals.
4. **ANIMALS CONTROLLED:** Mice and voles, rabbits and hares.
5. **WHEN USED:**
   Mice and voles: Coat the base of trees or shrubs thoroughly any time during the late fall.
   Rabbits and hares: Before snowfall, treat areas of trees or shrubs accessible to rabbits or hares, even after heavy snow accumulation. **Apply at temperatures above 4°C.**
6. **HOW TO APPLY:** Product can be sprayed or brushed on. In the case of planting stock, plants can be dipped.
   With: Paint brush, sprayer.
   Rate:
   Brushing: Thoroughly apply undiluted product with paint brush on areas of potential or occuring damage.
   Dipping: When planting, dip the tops of young trees or plants into undiluted product.
   Spraying: Mix product with equal volume of water. Apply to point of runoff.
7. **APPLICATION TIPS:** Use immediately after being mixed with water. Keep container tightly closed to prevent evaporation.
8. **HOW IT WORKS:** A taste repellant. Rodents are discouraged from feeding on vegetation that is treated with this product.
9. **EXPECTED RESULTS:** Prevention of rodent damage to areas treated.
10. **EFFECTS OF RAINFALL:** Heavy rains can wash part of the product off the treatment site. Do not apply if raining or if threat of rain exists.
11. **MOVEMENT IN SOIL:** None.
12. **GRAZING AND CROPPING RESTRICTIONS:** Do not apply to plant parts used for food or feed.
13. **TOXICITY:** Moderate acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (780-865). Skin contact or inhalation may cause irritation of the nose, throat, or skin and may induce an allergic reaction.
14. **PRECAUTIONS, FIRST AID:** Wash thoroughly after handling. Wash contaminated clothes with soap and water before reuse. Do not consume alcohol immediately before or within 24 hours after use of Thiram. Avoid breathing spray mist. Wash contaminated clothing with soap and water before wearing. **Keep out of reach of children.**
    Symptoms of poisoning: Nausea, vomiting, diarrhea, anorexia, hyperactivity and hypothermia.
    First Aid: If in eyes or on skin use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
15. **STORAGE:** Store in a cool, dry, ventilated place, away from feeds and food. Store above 0°C.

ZINC PHOSPHIDE

Bell/Cev

DANGER POISON

1. **FORMULATIONS:** Extruded Pellet; 2.0%; 1.36 kg bottle, 6 X 454 g pack, 22.7 kg bag.
2. **REGISTERED MIXES:** Use according to product label.
3. **REGISTERED USES:**
   Ground squirrels, pocket gophers: Farm buildings (ground squirrel only), farmyards, forage/field crops, gardens, nurseries, pasture/rangeland, residential areas, turf.
   Mice, voles: Dwellings, farm buildings, farmyards, orchards, storage areas.
4. **ANIMALS CONTROLLED:** Ground squirrels, mice and voles, pocket gophers.
5. **WHEN USED:**
   Mice, voles: Apply in orchards prior to snowfall and before leaf fall and lodging of grass. Use indoors within bait stations according to label and as necessary.
   Ground squirrels, pocket gophers: For best results, apply in early spring before vegetation regrowth.
   Number of applications:
   Ground squirrels: Plug all burrows 5 days after treatment, rebait opened burrows next day.
   Mice, voles: Inside maintain uninterrupted supply until feeding ceases. Outside re-apply after 2 weeks if mice still present.
   Pocket gophers: Re-apply after 10 days where rodents still active.
6. **HOW TO APPLY:**
   With: Bait stations, burrow builder, cyclone seeder, hand baiting.

Rate:

Ground squirrels: Place 5 g far into each burrow with a spoon.

Mice, voles: Inside areas, place 5 g in protected bait stations every 2-4 m. Outdoor areas, apply with cyclone spreader at 405 g-1.6 kg/ac. Apply 15 g around trees. If hazard to other animals exists, place 15 g of bait in protected bait stations every 2-4 m.

Pocket gophers: 5 g of bait into burrow using commercial or home-made probe. Apply with burrow builder at 1.1 L of bait/ac.

7. **APPLICATION TIPS:**
   Ground squirrel: Do not apply on bare ground. Never place bait in unprotected heaps or piles.
   Pocket gopher: Treat near fresh soil mounds. Plug probe hole after applying bait.
8. **HOW IT WORKS:** On contact with dilute acids of the stomach, phosphine is released. Death results from asphyxia.
9. **EXPECTED RESULTS:** Reduction or elimination of rodent population.
10. **EFFECTS OF RAINFALL:** Exposed bait can become neutralized and ineffective within several days. Paraffin coated pellets should be used for outdoor purposes to prevent rapid breakdown of toxicity.
11. **MOVEMENT IN SOIL:** None, breaks down rapidly to phosphine.
12. **GRAZING AND CROPPING RESTRICTIONS:** None if applied properly and at given rates.
13. **TOXICITY:** High acute mammalian toxicity. Acute oral LD_{50} rats (mg/kg) = (27). Toxic to all birds and other animals.
14. **PRECAUTIONS, FIRST AID:** Wear gloves. Wash hands after use. Keep unused bait in original container. **Keep out of reach of children.**
    Symptoms of poisoning: Nausea, vomiting (black vomitus with smell of phosphine), abdominal pain, chest tightness, excitement, and cold sensations. **If in eyes or on skin** use standard first aid measures (see page xxiii). **If swallowed** seek medical attention.
15. **STORAGE:** Do not store with other chemicals or pesticides, as the bait will become contaminated. Store under lock and key. Store bait in original container. Keep away from moisture.

HERBICIDE SELECTOR CHART – CEREALS

[1] Suppression only

CROP	BINDWEEDS	BLUEBUR	BUCKWHEAT (TARTARY)		BUCKWHEAT (WILD)		BUTTERCUP (CREEPING, TALL)
BARLEY	Cobutox 400[1] 2,4-D[1] 2,4-D Butyric 400[1] Embutox 625[1] Kil-Mor[1] MCPA[1] SEE Butyric 400[1] Target[1] Tropotox Plus[1]	Ally Buctril M 2,4-D Diphenoprop 600 Estaprop MCPA SEE Diphenoprop Stampede CM	Afolan + MCPA Ally Assert[1] Banvel Blagal Buctril M 2,4-D[1] Diphenoprop 600 Dyvel Estaprop Hoe-Grass II	Kil-Mor Lexone & Mixes Lorox + MCPA MCPA[1] Pardner SEE Diphenoprop Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C	Afolan + MCPA Ally[1] Ally + 2,4-D Ally + MCPA Assert[1] Banvel Blagal Buctril M Cobutox 400 2,4-D[1] Diphenoprop 600 Dyvel 2,4-D Butyric 400 Embutox 625 Estaprop Free Flow 10G	Glean + 2,4-D Hoe-Grass II Kil-Mor Lontrel Lorox + MCPA MCPA[1] Pardner Refine Rival 10G SEE Butyric 480 SEE Diphenoprop Stampede CM Stampede 360 Mixes Target Tordon 202C Treflan QR5	Compitox 2,4-D[1] (Creeping) MCPA Na-salt (Tall) Mecoprop Tropotox Plus[1]
WHEAT	Cobutox 400[1] 2,4-D[1] 2,4-D Butyric 400[1] Embutox 625[1] Kil-Mor[1] MCPA[1] SEE Butyric 480 Target[1] Tropotox Plus[1]	Ally Buctril M 2,4-D Diphenoprop 600 Estaprop Glean Laser (Hard Red Spring) MCPA SEE Diphenoprop Stampede CM	Afolan + MCPA Ally Assert[1] Banvel Blagal Buctril M 2,4-D[1] Diphenoprop 600 Dyvel Estaprop Hoe-Grass II Kil-Mor	Laser (Hard Red Spring) Lexone & Mixes Lorox + MCPA MCPA[1] Pardner SEE Diphenoprop Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C	Afolan + MCPA Ally[1] Ally + 2,4-D Ally + MCPA Assert[1] Banvel Blagal Buctril M Cobutox 400 2,4-D[1] 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625 Estaprop Glean + 2,4-D Heritage (Fallow year)	Hoe-Grass II Kil-Mor Laser (Hard Red Spring) Lontrel Lorox + MCPA MCPA[1] Pardner Refine Rival 10G SEE Butyric 480 SEE Diphenoprop Stampede CM Stampede 360 Mixes Target Tordon 202C Triumph Plus	Compitox 2,4-D[1] (Creeping) MCPA Na-salt (Tall) Mecoprop Tropotox Plus[1]
OATS	Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1] Kil-Mor[1] MCPA[1] SEE Butyric 480 Target[1] Tropotox Plus[1]	Buctril M MCPA Stampede CM	Afolan + MCPA Banvel Blagal Buctril M Dyvel Kil-Mor Lorox + MCPA MCPA1 Pardner Stampede CM Stampede 360 + MCPA ester Target		2,4-D Butyric 400 Afolan + MCPA Banvel Blagal Buctril M Cobutox 400 Dyvel Embutox 625 Kil-Mor	Lontrel MCPA[1] Pardner Refine SEE Butyric 480 Stampede CM Stampede 360 + MCPA ester Target	Compitox MCPA Na-salt (Tall) Mecoprop Tropotox Plus[1]
FALL RYE (Spring Application)	2,4-D[1] MCPA[1] Tropotox Plus[1]	Buctril M 2,4-D MCPA	Buctril M 2,4-D[1] MCPA[1] Pardner		Buctril M 2,4-D[1] MCPA[1] Pardner		2,4-D[1] (Creeping) MCPA Na-salt (Tall) Tropotox Plus[1]
TRITICALE			Hoe-Grass II Pardner		Hoe-Grass II Pardner		

HERBICIDE SELECTOR CHART – CEREALS

[1] Suppression only

CROP	CATCHFLY NIGHT-FLOWERING	CHAMOMILE (SCENTLESS)	CHICKWEED (COMMON)	CLEAVERS	COCKLE (COW)	DANDELION	DARNEL (PERSIAN)
BARLEY	Buctril M Diphenoprop 600 Estaprop Hoe-Grass II Pardner SEE Diphenoprop Sencor Target	Buctril M Hoe-Grass II Lontrel Pardner	Advance 10G Afolan + MCPA Ally Blagal Compitox Free Flow Lexone & Mixes Lorox + MCPA Mecoprop Refine Rival 10G Sencor & Mixes Treflan QR5	Banvel[1] Compitox Dyvel[1] Kil-Mor[1] Mecoprop Target	Advance 10G Afolan + MCPA Ally Banvel Buctril M Dyvel Free Flow Glean Hoe-Grass II Kil-Mor Lorox + MCPA Pardner Refine Rival 10G Target Treflan QR5	Afolan + MCPA Cobutox 400[1] Compitox 2,4-D[1] 2,4-D Butyric 400[1] Embutox 625[1] MCPA amine[1] MCPA ester[1] MCPA K-salt Mecoprop SEE Butyric 480 SEE MCPA[1] Tordon 202C	Advance 10G Free Flow Hoe-Grass II Hoe-Grass 284 Rival 10G Treflan QR5
WHEAT	Buctril M Diphenoprop 600 Estaprop Hoe-Grass II Laser (Hard Red Spring) Pardner Sencor SEE Diphenoprop Target	Buctril M Hoe-Grass II Laser (Hard Red Spring) Lontrel Pardner	Afolan + MCPA Ally Blagal Compitox Lexone & Mixes Lorox + MCPA Mecoprop Refine Sencor & Mixes Triumph Plus	Banvel[1] Compitox Dyvel[1] Kil-Mor[1] Mecoprop Target	Advance 10G (Fallow year) Afolan + MCPA Ally Banvel Buctril M Dyvel Glean Heritage (Fallow year) Hoe-Grass II Kil-Mor Laser (Hard Red Spring) Lorox + MCPA Pardner Refine Target Triumph Plus	Afolan + MCPA Cobutox 400[1] Compitox 2,4-D[1] 2,4-D Butyric 400[1] Embutox 625[1] MCPA amine[1] MCPA ester[1] MCPA K-salt Mecoprop SEE Butyric 480[1] SEE MCPA[1] Tordon 202C	Advance 10G (Fallow year) Heritage (Fallow year) Hoe-Grass II Hoe-Grass 284
OATS	Buctril M Pardner Target	Buctril M Lontrel Pardner	Afolan + MCPA Blagal Compitox Lorox + MCPA Mecoprop Refine	Banvel[1] Compitox Dyvel[1] Kil-Mor[1] Mecoprop Mecoturf Target	Afolan + MCPA Banvel Buctril M Dyvel Glean Kil-Mor Lorox + MCPA Pardner Refine Target	Afolan + MCPA Cobutox 400[1] Compitox 2,4-D Butyric 400[1] Embutox 625[1] MCPA amine[1] MCPA ester[1] MCPA K-salt Mecoprop SEE Butyric 480[1] SEE MCPA[1]	
FALL RYE (Spring Application)	Buctril M Pardner	Buctril M Pardner			Banvel Buctril M Pardner	2,4-D[1] MCPA amine[1] MCPA ester[1] MCPA K-salt SEE MCPA[1]	Hoe-Grass 284
TRITICALE	Hoe-Grass II Pardner	Hoe-Grass II Pardner			Hoe-Grass II Pardner		Hoe-Grass II Hoe-Grass 284

HERBICIDE SELECTOR CHART – CEREALS

[1] Suppression only

CROP	FLIXWEED	FOXTAIL (GREEN)	GRASS (BARNYARD)	GRASS (QUACK)	GROUNDSEL (COMMON)	HAWK'S-BEARD NARROW-LEAVED
BARLEY	Ally Blagal Buctril M Diphenoprop 600 Dyvel 2,4-D Estaprop Glean Kil-Mor Lorox + MCPA MCPA SEE Diphenoprop Sencor Stampede CM Stampede 360 Mixes Target	Advance 10G Afolan + MCPA[1] Fortress Free Flow Hoe-Grass II Hoe-Grass 284 Lorox + MCPA[1] NaTA Rival 500EC/10G Stampede CM Stampede 360 Mixes Treflan Trifurex	Advance 10G Free Flow Hoe-Grass II Hoe-Grass 284 Rival 10G Treflan QR5	NaTA[1]	Afolan + MCPA Buctril M Hoe-Grass II Pardner Sencor + Mixes	Ally + 2,4-D Cobutox 400 2,4-D[1] 2,4-D Butyric 400 Embutox 625 Glean + 2,4-D SEE Butyric 480
WHEAT	Ally Blagal Buctril M 2,4-D Diphenoprop 600 Dyvel Estaprop Glean Kil-Mor Laser (Hard Red Spring) Lorox + MCPA MCPA SEE Diphenoprop Sencor Stampede CM Stampede 360 Mixes Target Triumph Plus	Advance 10G Afolan + MCPA[1] Fortress Heritage Hoe-Grass II Hoe-Grass 284 Laser (Hard Red Spring) Lorox + MCPA[1] Stampede CM Stampede 360 Mixes Rival 500 EC/10G Treflan 545 EC Triflurex Triumph Plus	Advance 10G Heritage (Fallow year) Hoe-Grass II Hoe-Grass 284		Afolan + MCPA Buctril M Hoe-Grass II Laser (Hard Red Spring) Pardner Sencor + Mixes	Ally + 2,4-D Cobutox 400 2,4-D[1] 2,4-D Butyric 400 Embutox 625 Glean + 2,4-D SEE Butyric 480 Stampede 360 + 2,4-D
OATS	Banvel + MCPA Blagal Buctril M Dyvel Glean Kil-Mor Lorox + MCPA MCPA Stampede CM Stampede 360 + MCPA ester Target	Afolan + MCPA[1] Lorox + MCPA[1] NaTA Stampede CM Stampede 360 + MCPA ester		NaTA[1]	Afolan + MCPA Buctril M Pardner	Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480
FALL RYE (Spring Application)	Buctril M 2,4-D MCPA	Hoe-Grass 284	Hoe-Grass 284		Buctril M Pardner	2,4-D[1]
TRITICALE		Hoe-Grass II Hoe-Grass 284	Hoe-Grass II Hoe-Grass 284		Hoe-Grass II Pardner	

HERBICIDE SELECTOR CHART – CEREALS

[1] Suppression only

CROP	HEMP-NETTLE	HENBIT	HORSETAIL (FIELD)	KNAWEL	KNOTWEED	KOCHIA
BARLEY	Afolan + MCPA Ally Blagal Dyvel Glean Lexone & Mixes Lorox + MCPA MCPA[1] Refine Sencor + Mixes Stampede 360 + Glean Target Tropotox Plus[1]	Sencor & Mixes	Afolan + MCPA[1] Blagal[1] Cobutox 400[1] 2,4-D[1] 2,4-D Butyric 400[1] Embutox 625[1] MCPA[1] SEE Butyric 480[1] Tropotox Plus	Hoe-Grass II Pardner	Advance 10G Free Flow 10G Kil-Mor Rival 10G Target Treflan	Afolan + MCPA Ally Blagal Buctril M Diphenoprop 600 Dyvel 2,4-D Estaprop Glean + 2,4-D Glean + MCPA Hoe-Grass II MCPA amine MCPA ester MCPA K-salt Pardner Refine[1] SEE Diphenoprop SEE MCPA Stampede CM Stampede 360 Mixes Target
WHEAT	Afolan + MCPA Ally Blagal Dyvel Glean Lexone Lorox + MCPA MCPA[1] Refine Sencor & Mixes Stampede 360 + Glean Target Triumph Plus Tropotox Plus[1]	Sencor & Mixes	Afolan + MCPA[1] Blagal[1] Cobutox 400[1] 2,4-D[1] 2,4-D Butyric 400[1] Embutox 625[1] MCPA[1] SEE Butyric 480[1] Tropotox Plus	Hoe-Grass II Pardner	Kil-Mor Target	Afolan + MCPA Ally Blagal Buctril M Diphenoprop 600 Dyvel 2,4-D Estaprop Glean + 2,4-D Glean + MCPA Stampede CM Hoe-Grass II Laser (Hard Red Spring) MCPA amine MCPA ester MCPA K-salt Stampede 360 Mixes Pardner Refine[1] SEE Diphenoprop SEE MCPA Target Triumph Plus
OATS	Afolan + MCPA Blagal Dyvel Glean Lorox + MCPA MCPA[1] Refine Target Tropotox Plus		Afolan + MCPA[1] Blagal[1] Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1] MCPA[1] SEE Butyric 480 Tropotox Plus	Pardner	Kil-Mor Target	Afolan + MCPA Blagal Buctril M Dyvel Glean + MCPA MCPA amine MCPA ester MCPA K-salt Pardner Refine[1] SEE MCPA Stampede 360 + MCPA ester Stampede CM Target
FALL RYE (Spring Application)	MCPA[1] Tropotox Plus		2,4-D[1] MCPA[1] Tropotox Plus	Pardner		Buctril M 2,4-D MCPA amine MCPA ester MCPA K-salt Pardner SEE MCPA
TRITICALE				Hoe-Grass II Pardner		Hoe-Grass II Pardner

HERBICIDE SELECTOR CHART – CEREALS

[1] Suppression only

CROP	LAMB'S QUARTERS		MUSTARDS, RAPESEED (VOL.)		NIGHTSHADE (AMERICAN, BLACK, HAIRY)	OATS (WILD, VOL.)	PIGWEED (PROSTRATE)
BARLEY	Advance 10G Afolan + MCPA Ally[1] Ally + 2,4-D Ally + MCPA Blagal Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625 Estaprop Free Flow Glean Hoe-Grass II	Kil-Mor Lexone & Mixes Lorox + MCPA MCPA Pardner Refine Rival 10G SEE Butyric 480 SEE Diphenoprop Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C Tropotox Plus Treflan QR5	Afolan + MCPA Ally Assert Blagal Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625 Estaprop Glean	Hoe-Grass II Kil-Mor Lexone & Mixes MCPA Pardner Refine SEE Butyric 480 SEE Diphenoprop Sencor + Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C Tropotox Plus	Buctril M (American) Mecoprop Pardner (American) (Black)	Advance 10G Assert Avadex BW Avenge Fortress Free Flow Hoe-Grass II Hoe-Grass 284 Rival 10G Treflan QR5	Afolan + MCPA Ally 2,4-D Dyvel Free Flow Kil-Mor MCPA-K Rival 10G Target Treflan QR5
WHEAT	Afolan + MCPA Ally[1] Ally + 2,4-D Ally + MCPA Blagal Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Lorox + MCPA Embutox 625 Estaprop Glean Heritage Hoe-Grass II	Kil-Mor Laser (Hard Red Spring) Lexone & Mixes MCPA Pardner Refine Rival 10G (Fallow year) SEE Butyric 480 SEE Diphenoprop 600 Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C Tropotox Plus Triumph Plus	Afolan + MCPA Ally Assert Blagal Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625 Estaprop Glean Hoe-Grass II Kil-Mor	[illegible]er (Hard [illegible]Red Spring) Lexone & Mixes MCPA Pardner Refine SEE Butyric 480 SEE Diphenoprop Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C Triumph Plus Tropotox Plus	Buctril M (American) Pardner (American) (Black)	Advance 10G (Fallow year) Assert Avadex BW Avenge Fortress Heritage (Fallow year) Hoe-Grass II Hoe-Grass 284 Matavan L Rival 10G[1] (Fallow year) Triumph Plus	Afolan + MCPA Ally 2,4-D Dyvel Kil-Mor MCPA-K Target
OATS	Afolan + MCPA Blagal Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox 625 Glean Kil-Mor Lorox + MCPA	MCPA Pardner Refine SEE Butyric 480 Stampede CM Stampede 360 + MCPA ester Target Tropotox Plus	Afolan + MCPA Blagal Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox 625 Glean Kil-Mor	MCPA Pardner Refine SEE Butyric 480 Stampede CM Stampede 360 + MCPA ester Target Tropotox Plus	Buctril M (American) Pardner (American) (Black)		Afolan + MCPA Dyvel Kil-Mor MCPA-K Target
FALL (Spring Application)	Buctril M 2,4-D MCPA Pardner Tropotox Plus		Buctril M 2,4-D MCPA Pardner Tropotox Plus		Buctril M (American) Pardner (American) (Black)	Avenge Hoe-Grass 284	2,4-D MCPA-K
TRITICALE	Hoe-Grass II Pardner		Hoe-Grass II Pardner		Pardner (American) (Black)	Avenge Hoe-Grass II Hoe-Grass 284 Mataven L	

HERBICIDE SELECTOR CHART – CEREALS

[1] Suppression only

CROP	PIGWEED (REDROOT)		PIGWEED (RUSSIAN)	RADISH (WILD)	RAGWEED	SHEPHERD'S-PURSE	
BARLEY	Advance 10G Afolan + MCPA Ally Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625 Estaprop Free Flow 10G Glean Hoe-Grass II Kil-Mor Lexone & Mixes Lorox + MCPA MCPA amine	MCPA ester[1] MCPA K-salt MCPA Na-salt Pardner Refine Rival 10G SEE Butyric 480 SEE Diphenoprop SEE MCPA[1] Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C Treflan QR5 Triumph Tropotox Plus	Afolan + MCPA amine 2,4-D Diphenoprop 600 Dyvel Estaprop Glean + 2,4-D Glean + MCPA MCPA SEE Diphenoprop	Afolan + MCPA Blagal Dyvel 2,4-D MCPA Tropotox Plus[1]	Afolan + MCPA Blagal Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625 Estaprop Kil-Mor Lorox + MCPA MCPA Pardner SEE Butyric 480 SEE Diphenoprop Target Tropotox Plus	Afolan + MCPA Ally Blagal Buctril M Cobutox 400 Diphenoprop 600 Dyvel 2,4-D 2,4-D Butyric 400 Embutox 625 Estaprop Glean	Kil-Mor Lexone & Mixes Lorox + MCPA MCPA SEE Butyric 480 SEE Diphenoprop Sencor + Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C Tropotox Plus
WHEAT	Advance 10G (Fallow year) Afolan + MCPA Ally Blagal Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625 Estaprop Glean Heritage (Fallow year) Laser (Hard Red Spring) Kil-Mor	Lexone & Mixes Lorox + MCPA MCPA amine MCPA ester[1] MCPA K-salt MCPA Na-salt Pardner Refine SEE Butyric 480 SEE Diphenoprop SEE MCPA[1] Sencor & Mixes Stampede 360 Mixes Stampede CM Target Tordon 202C Triumph Plus Tropotox Plus	Afolan + MCPA amine 2,4-D Diphenoprop 600 Dyvel Estaprop MCPA Stampede 360 + 2,4-D Glean + 2,4-D Glean + MCPA SEE Diphenoprop Triumph	Afolan + MCPA Blagal 2,4-D Dyvel MCPA Stampede 360+2,4-D Triumph Tropotox Plus[1]	Afolan + MCPA Blagal Buctril M Cobutox 400 Diphenoprop 600 Dyvel 2,4-D 2,4-D Butyric 400 Embutox 625 Estaprop Kil-Mor Lorox + MCPA MCPA Pardner SEE Butyric 480 SEE Diphenoprop Target Triumph Plus Tropotox Plus	Afolan + MCPA Ally Blagal Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625 Estaprop Glean Kil-Mor	Laser (Hard Red Spring) Lexone & Mixes Lorox + MCPA MCPA SEE Butyric 480 SEE Diphenoprop Sencor + Mixes Stampede 360 Mixes Stampede CM Target Triumph Plus Tropotox Plus
OATS	Afolan + MCPA Banvel + MCPA Blagal Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox 625 Glean Kil-Mor Lorox + MCPA MCPA amine	MCPA ester[1] MCPA K-salt MCPA Na-salt Pardner Refine SEE Butyric 480 SEE MCPA[1] Stampede CM Stampede 360 + MCPA ester Target Tropotox Plus	Afolan + MCPA amine Dyvel MCPA Glean + MCPA Stampede 360 + MCPA ester	Afolan + MCPA Blagal Dyvel MCPA Tropotox Plus[1]	Afolan + MCPA Blagal Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox 625 Kil-Mor Lorox + MCPA MCPA Pardner Target Tropotox Plus	Afolan + MCPA Blagal Buctril M Cobutox 400 Dyvel 2,4-D Butyric 400 Embutox 625 Glean Kil-Mor	Lorox + MCPA MCPA SEE Butyric 480 Stampede CM Stampede 360 + MCPA ester Target Tropotox Plus
FALL RYE (Spring Application)	Buctril M 2,4-D MCPA amine MCPA ester[1] MCPA K-salt	MCPA Na-salt Pardner SEE MCPA Tropotox Plus	2,4-D MCPA	2,4-D MCPA Tropotox Plus	2,4-D MCPA Pardner Tropotox Plus	Buctril M 2,4-D MCPA Tropotox Plus	
TRITICALE	Hoe-Grass II Pardner						

HERBICIDE SELECTOR CHART – CEREALS

[1] Suppression only

CROP	SMARTWEED (ANNUAL)		SOW-THISTLES (ANN. & PER.)		SPURGE (LEAFY)	SPURRY (CORN)	STINKWEED	
BARLEY	Afolan + MCPA Ally Banvel Blagal Buctril M Cobutox 400[1] Diphenoprop 600 Dyvel 2,4-D 2,4-D Butyric 400[1] Embutox 625[1] Estaprop Glean Hoe-Grass II Kil-Mor Lexone & Mixes	Lorox + MCPA MCPA amine[1] MCPA ester[1] MCPA K-salt MCPA Na-salt Pardner Refine SEE Butyric 480[1] SEE Diphenoprop SEE MCPA[1] Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C	Afolan + MCPA (Per-seedlings) Ally[1] Banvel[1] (Per) Buctril M[1] (Per) Cobutox 400[1] (Per) Diphenoprop 600 Dyvel[1] 2,4-D[1] 2,4-D Butyric 400[1] (Per) Embutox 625[1] (Per) Estaprop (Ann)[1]	Estaprop[1] (Per) Kil-Mor (Ann) Lontrel[1] (Per) MCPA[1] SEE Butyric 480[1] (Per) SEE Diphenoprop Sencor Mixes[1] Target (Ann) Target[1] (Per) Tordon 202C[1] (Per) Tropotox Plus[1]	2,4-D[1] MCPA[1]	Afolan + MCPA Banvel Blagal Compitox Dyvel Kil-Mor Lexone & Mixes Lorox + MCPA MCPA K-salt Mecoprop Refine Sencor & Mixes Target	Afolan + MCPA Ally Assert Banvel + Lexone Banvel + Sencor Banvel + 2,4-D Banvel + MCPA Blagal Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625	Estaprop Glean Hoe-Grass II Kil-Mor Lexone & Mixes Lorox + MCPA MCPA Pardner Refine Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C Tropotox Plus
WHEAT	Afolan + MCPA Ally Banvel Blagal Buctril M Cobutox 400[1] Diphenoprop 600 Dyvel 2,4-D 2,4-D Butyric 400[1] Embutox 625[1] Estaprop Glean Hoe-Grass II Kil-Mor Laser Lexone & Mixes	Lorox + MCPA MCPA amine[1] MCPA ester[1] MCPA K-salt MCPA Na-salt Pardner Refine SEE Butyric 480[1] SEE Diphenoprop SEE MCPA[1] Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C Triumph Plus	Afolan + MCPA (Per-seedlings) Ally[1] Banvel[1] (Per) Buctril M[1] Cobutox 400[1] (Per) Diphenoprop 600[1] Dyvel[1] 2,4-D[1] 2,4-D Butyric 400[1] (Per) Embutox 625[1] (Per) Estaprop[1] (Ann) Estaprop[1] (Per)	Kil-Mor (Ann) Laser (Hard Red Spring)[1] (Per) Lontrel[1] (Per) MCPA[1] SEE Butyric 480[1] (Per) SEE Diphenoprop Sencor Mixes[1] Target (Ann) Target[1] (Per) Tordon 202C[1] Tropotox Plus[1]	2,4-D[1] MCPA[1]	Afolan + MCPA Banvel Blagal Compitox Dyvel Kil-Mor Lexone & Mixes Lorox + MCPA MCPA K-salt Mecoprop Refine Sencor & Mixes Target Triumph Plus	Afolan + MCPA Ally Assert Blagal Buctril M Cobutox 400 2,4-D 2,4-D Butyric 400 Diphenoprop 600 Dyvel Embutox 625 Estaprop Glean Hoe-Grass II	Kil-Mor Laser (Hard Red Spring) Lexone & Mixes Lorox + MCPA MCPA Pardner Refine Sencor & Mixes Stampede CM Stampede 360 Mixes Target Tordon 202C Tropotox Plus
OATS	Afolan + MCPA Banvel Blagal Buctril M Cobutox 400[1] Dyvel 2,4-D Butyric 400[1] Embutox 625[1] Glean Kil-Mor Lorox + MCPA MCPA amine[1]	MCPA ester[1] MCPA K-salt MCPA Na-salt Refine SEE Butyric 480[1] SEE MCPA[1] Stampede CM Stampede 360 + MCPA ester Target Tropotox Plus	Afolan + MCPA (Per-seedlings) Banvel[1] (Per) Buctril M[1] (Per) Cobutox 400[1] (Per) Dyvel[1] 2,4-D Butyric 400[1] (Per) Embutox 625[1] (Per)	Kil-Mor (Ann) Lontrel[1] (Per) MCPA[1] SEE Butyric 480[1] (Per) Target (Ann) Target[1] (Per) Tropotox Plus[1]	MCPA[1]	Afolan + MCPA Banvel Blagal Compitox Dyvel Kil-Mor Lorox + MCPA MCPA K-salt Mecoprop Refine Reglone Target	Afolan + MCPA Blagal Buctril M Cobutox 400 2,4-D Butric 400 Dyvel Embutox 625 Glean Kil-Mor Lorox + MCPA	MCPA Pardner Refine SEE Butyric 480 Stampede CM Stampede 360 + MCPA ester Target Triumph Tropotox Plus
FALL RYE (Spring Application)	Buctril M 2,4-D MCPA amine[1] MCPA ester[1]	MCPA K-salt MCPA Na-salt Pardner SEE MCPA[1]	Banvel[1] (Per) Buctril M[1] (Per) 2,4-D[1] MCPA[1] MCPA K-salt (Per) Tropotox Plus[1]		2,4-D[1] MCPA[1]	MCPA K-salt	Buctril M 2,4-D MCPA Pardner Tropotox Plus	
TRITICALE	Hoe-Grass II Pardner						Hoe-Grass II Pardner	

HERBICIDE SELECTOR CHART – CEREALS

[1] Suppression only

CROP	STORK'S-BILL	THISTLE (CANADA)		THISTLE (RUSSIAN)		TOADFLAX
BARLEY	Afolan + MCPA Diphenoprop 600 Estaprop Glean Lorox + MCPA SEE Diphenoprop	Ally[1] Ally + 2,4-D Banvel Blagal[1] Buctril M[1] Cobutox 400[1] Compitox[1] Diphenoprop 600[1] Dyvel[1] 2,4-D[1] 2,4-D Butyric 400[1] Embutox 625[1] Estaprop[1]	Glean + 2,4-D[1] Kil-Mor[1] Lontrel Lorox + MCPA[1] MCPA[1] Mecoprop[1] Refine + MCPA[1] SEE Butyric 480[1] SEE Diphenoprop[1] Sencor & Mixes[1] Target[1] Tordon 202C[1] Tropotox Plus[1]	Advance 10G Ally[1] Ally + 2,4-D Ally + MCPA Buctril M 2,4-D Diphenoprop 600 Dyvel Estaprop Free Flow 10G	Glean + 2,4-D Hoe-Grass II Kil-Mor Pardner Refine Rival 10G SEE Diphenoprop Sencor Mixes Target Tordon 202C	Diphenoprop 600[1] Estaprop[1] SEE Diphenoprop[1]
WHEAT	Afolan + MCPA Diphenoprop 600 Estaprop Glean Lorox + MCPA SEE Diphenoprop	Ally[1] Ally + 2,4-D Banvel[1] Blagal[1] Buctril M[1] Cobutox 400[1] Compitox[1] Diphenoprop 600[1] Dyvel[1] 2,4-D[1] 2,4-D Butyric 400[1] Embutox 625[1] Estaprop[1] Glean + 2,4-D[1]	Kil-Mor[1] Laser[1] (Hard Red Spring) Lontrel Lorox + MCPA[1] MCPA[1] Mecoprop[1] Refine + MCPA[1] SEE Butyric 480[1] SEE Diphenoprop[1] Sencor & Mixes[1] Target[1] Tordon 202C[1] Tropotox Plus[1]	Advance 10G (Fallow year) Ally[1] Ally + 2,4-D Ally + MCPA Buctril M Diphenoprop 600 Dyvel 2,4-D Estaprop Glean + 2,4-D	Heritage (Fallow year) Hoe-Grass II Kil-Mor Pardner Refine SEE Diphenoprop Sencor Mixes Target Tordon 202C Triumph Plus	Diphenoprop 600[1] Estaprop[1] SEE Diphenoprop[1]
OATS	Afolan + MCPA Glean Lorox + MCPA	Banvel[1] Blagal[1] Buctril M[1] Cobutox 400[1] Compitox[1] Dyvel[1] 2,4-D Butyric 400[1] Embutox 625[1] Glean + 2,4-D[1]	Kil-Mor[1] Lontrel Lorox + MCPA[1] MCPA[1] Mecoprop[1] Refine + MCPA[1] SEE Butyric 480[1] Target[1] Tropotox Plus[1]	Buctril M Dyvel Kil-Mor Pardner Refine Target		
FALL RYE (Spring Application)		Buctril M[1] 2,4-D[1] MCPA[1] Tropotox Plus[1]		2,4-D Pardner		
TRITICALE				Hoe-Grass II Pardner		

HERBICIDE SELECTOR CHART – OILSEEDS

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant

CROP	BINDWEEDS	BLUEBUR	BUCKWHEAT (TARTARY)	BUCKWHEAT (WILD)	BUTTERCUP (CREEPING, TALL)	CATCHFLY (NIGHT-FLOWERING)	CHAMOMILE (SCENTLESS)
CANOLA (TTC - triazine tolerant canola)	Reglone[3]	Reglone[3]	Reglone[3] Sencor (TTC)	Advance 10G Edge Bladex (TTC) Free Flow Lontrel Reglone[3] Rival Treflan Triflurex	Reglone[3]	Reglone[3] Sencor (TTC)	Lontrel Reglone[3]
FLAX	Basagran MCPA[1] Reglone[3]	Buctril M MCPA[1] Reglone[3] Stampede CM	Buctril M Hoe-Grass II MCPA[1] Reglone[3] Stampede CM Stampede 360 Mixes	Advance 10G Buctril M Free Flow Hoe-Grass II Lontrel Rival Stampede CM Stampede 360 Mixes Treflan	Basagran 2,4-D[1] (Creeping) MCPA Na-salt (Tall) Reglone[3]	Buctril M Hoe-Grass II Reglone[3]	Buctril M Hoe-Grass II Lontrel Reglone[3]
MUSTARD	Reglone[3]	Reglone[3]	Reglone[3]	Advance 10G Edge Free Flow Reglone[3] Rival Treflan Triflurex	Reglone[3]	Reglone[3]	Reglone[3]
SUNFLOWERS			Reglone[3]	Advance 10G Edge Free Flow Reglone[3] Rival Treflan Triflurex	Reglone[3]	Reglone[3]	

HERBICIDE SELECTOR CHART – OILSEEDS

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant

CROP	CHICKWEED (COMMON)	CLEAVERS	COCKLE (COW)	DANDELION	DARNEL (PERSIAN)	FLIXWEED	FOXTAIL (GREEN)
CANOLA (TTC - triazine tolerant canola)	Advance 10G Edge Bladex (TTC) Free Flow Reglone[3] Rival Sencor (TTC) Treflan Triflurex	Bladex (TTC) Reglone[3]	Advance 10G Edge Free Flow Reglone[3] Rival Treflan Triflurex	Reglone[3]	Advance 10G Free Flow Fusilade 250/II Hoe-Grass 284 Poast Reglone[3] Rival Treflan Triflurex	Reglone[3] Sencor (TTC)	Advance 10G Edge Excel Fortress Free Flow Fusilade 250/II Hoe-Grass 284 NaTA Poast Reglone[3] Rival Treflan Triflurex
FLAX	Advance 10G Basagran Eptam Free Flow Reglone[3] Rival Treflan	Reglone[3]	Advance 10G Buctril M Free Flow Hoe-Grass II Reglone[3] Rival Treflan	MCPA amine[1] MCPA ester[1] MCPA K-salt Reglone[3]	Advance 10G Free Flow Fusilade 250/II Hoe-Grass II Hoe-Grass 284 Poast Reglone[3] Rival Treflan	Blagal Buctril M MCPA Reglone[3] Stampede CM Stampede 360 Mixes	Advance 10G Eptam Excel Free Flow Fortress Fusilade 250/II Hoe-Grass II Hoe-Grass 284 NaTA Poast Reglone[3] Rival Stampede CM Stampede 360 Mixes Treflan
MUSTARD	Advance 10G Edge Free Flow Reglone[3] Rival Treflan Triflurex	Reglone[3]	Advance 10G Edge Free Flow Reglone[3] Rival Treflan Triflurex	Reglone[3]	Advance 10G Free Flow Hoe-Grass 284 Reglone[3] Rival Treflan Triflurex	Reglone[3]	Advance 10G Edge Excel Fortress Free Flow Hoe-Grass 284 Reglone[3] Rival Treflan Triflurex
SUNFLOWERS	Advance 10G Edge Eptam Free Flow Reglone[3] Rival Treflan Triflurex		Advance 10G Edge Free Flow Reglone[3] Rival Treflan Triflurex		Advance 10G Free Flow Fusilade 250/II Hoe-Grass 284 Reglone[3] Rival Treflan Triflurex		Advance 10G Edge Eptam Excel Free Flow Fusilade 250/II Hoe-Grass 284 Reglone[3] Rival Treflan Triflurex

HERBICIDE SELECTOR CHART – OILSEEDS

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant

CROP	GRASS (BARNYARD)	GRASS (QUACK)	GROUNDSEL (COMMON)	HAWK'S-BEARD (NARROW-LEAVED)	HEMP-NETTLE	HENBIT	HORSETAIL (FIELD)
CANOLA (TTC - triazine tolerant canola)	Advance 10G Edge Excel Free Flow Fusilade 250 II Hoe-Grass 284 Poast Reglone[3] Rival Treflan Triflurex	Fusilade 250[1] Fusilade II NaTA Poast Reglone[3]	Bladex (TTC) Reglone[3] Sencor (TTC)	Reglone[3]	Bladex (TTC) Edge[1] Muster Reglone[3] Sencor (TTC)	Reglone[3] Sencor (TTC)	Reglone[3]
FLAX	Advance 10G Eptam Excel Free Flow Fusilade 250 II Hoe-Grass II Hoe-Grass 284 Poast Reglone[3] Rival Treflan	Eptam Fusilade 250 II NaTA[1] Poast Reglone[3]	Basagran Buctril M Hoe-Grass II Reglone[3]	Reglone[3]	MCPA[1] Reglone[3]	Eptam Reglone[3]	MCPA[1] Reglone[3]
MUSTARD	Advance 10G Edge Excel Free Flow Hoe-Grass 284 Reglone[3] Rival Treflan Triflurex	Reglone[3]	Reglone[3]	Reglone[3]	Edge[1] Reglone[3]	Reglone[3]	Reglone[3]
SUNFLOWERS	Advance 10G Edge Eptam Excel Free Flow Fusilade 250 II Hoe-Grass 284 Reglone[3] Rival Treflan Triflurex	Eptam Fusilade 250 II Reglone[3]	Reglone[3]		Edge[1] Reglone[3]	Eptam Reglone[3]	

HERBICIDE SELECTOR CHART – OILSEEDS

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant

CROP	KNAWEL	KNOTWEED	KOCHIA	LAMB'S QUARTERS	MUSTARDS, RAPESEED (VOL.)	NIGHTSHADE (AMERICAN, BLACK, HAIRY)	OATS (WILD, VOL.)
CANOLA (TTC - triazine tolerant canola)	Reglone[3]	Reglone[3] Rival Treflan Triflurex	Edge Reglone[3]	Bladex (TTC) Edge Reglone[3] Rival Sencor (TTC) Treflan Triflurex	Bladex (TTC) Reglone[3] Sencor (TTC)	Edge[1] (American)[1] (Black)[1] Reglone[3]	Advance 10G Avadex BW Edge Excel Fortress Free Flow Fusilade 250 II Hoe-Grass 284 Poast Reglone[3] Rival Treflan Triflurex
FLAX	Hoe-Grass II Reglone[3]	Advance 10G Free Flow Rival Treflan	Buctril M Hoe-Grass II MCPA amine MCPA ester MCPA K-salt Reglone[3] Stampede CM Stampede 360 Mixes	Advance 10G Basagran Buctril M Eptam Free Flow Hoe-Grass II MCPA Reglone[3] Rival Stampede CM Stampede 360 Mixes Treflan	Basagran Buctril M Hoe-Grass II MCPA Reglone[3] Stampede CM Stampede 360 Mixes	Basagran (Hairy) Buctril M (American) Eptam (Hairy) Reglone[3]	Advance 10G Avadex BW Eptam Excel Fortress Free Flow Fusilade 250 II Hoe-Grass II Hoe-Grass 284 Poast Reglone[3] Rival Treflan
MUSTARD	Reglone[3]	Advance 10G Free Flow Reglone[3] Rival Treflan Triflurex	Edge Reglone[3]	Advance 10G Edge Free Flow Reglone[3] Rival Treflan Triflurex	Reglone[3]	Edge[1] (American)[1] (Black)[1] Reglone[3]	Advance 10G Avadex BW Edge Excel Fortress Free Flow Hoe-Grass 284 Reglone[3] Rival Treflan Triflurex
SUNFLOWERS		Advance 10G Free Flow Reglone[3] Rival Treflan Triflurex	Edge Reglone[3]	Advance 10G Edge Eptam Free Flow Reglone[3] Rival Treflan Triflurex	Reglone[3]	Edge[1] (American)[1] (Black)[1] Eptam (Hairy) Reglone[3]	Advance 10G Edge Excel Eptam Free Flow Fusilade Hoe-Grass 284 Mataven L Reglone[3] Rival Treflan Triflurex

HERBICIDE SELECTOR CHART – OILSEEDS

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant

CROP	PIGWEED PROSTRATE	PIGWEED (REDROOT)	PIGWEED (RUSSIAN)	RADISH (WILD)	RAGWEED	SHEPHERD'S-PURSE	SMARTWEED (ANNUAL)
CANOLA (TTC - triazine tolerant canola)	Edge Reglone[3]	Bladex (TTC) Edge Muster Reglone[3] Sencor (TTC)	Edge Reglone[3] Sencor (TTC)	Reglone[3] Sencor (TTC)	Reglone[3]	Bladex (TTC) Reglone[3] Sencor (TTC)	Bladex (TTC) Edge[1] Muster Reglone[3] Sencor (TTC)
FLAX	Eptam (ppi) MCPA K-salt Reglone[3]	Basagran Eptam (ppi) Hoe-Grass II MCPA ester[1] MCPA K-salt MCPA Na-salt Reglone[3] Stampede CM	Reglone[3]	Basagran Hoe-Grass II MCPA Reglone[3] Stampede 360 Mixes	Basagran Buctril M MCPA Reglone[3]	Basagran Buctril M MCPA[1] Reglone[3]	Basagran Buctril M 2,4-D[1] Hoe-Grass II MCPA amine[1] MCPA ester[1] Reglone[3] Stampede CM
MUSTARD	Edge Reglone[3]	Edge Reglone[3]	Edge Reglone[3]	Reglone[3]	Reglone[3]	Reglone[3]	Edge[1] Reglone[3]
SUNFLOWERS	Edge Eptam Reglone[3]	Edge Eptam (ppi)	Edge Reglone[3]	Reglone[3]		Reglone[3]	Edge[1] Reglone[3]

HERBICIDE SELECTOR CHART – OILSEEDS

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant

CROP	SOW-THISTLES (ANN. & PER.)	SPURGE (LEAFY)	SPURRY (CORN)	STINKWEED	STORK'S-BILL	THISTLE- (CANADA)	THISTLE (RUSSIAN)
CANOLA (TTC - triazine tolerant canola)	Lontrel[1] (Per) Poast CT Reglone[3]	Reglone[3]	Edge Reglone[3] Sencor (TTC)	Bladex (TTC) Reglone[3] Sencor (TTC)	Reglone[3]	Lontrel Poast CT[1] Reglone[3]	Edge[1] Free Flow Reglone[3] Rival Sencor (TTC) Triflurex
FLAX	Buctril M[1] (Per) Lontrel[1] (Per) MCPA[1] MCPA K-salt (Ann) Reglone[3]	MCPA[1] Reglone[3]	Basagran Eptam MCPA K-salt Reglone[3]	Basagran Buctril M Hoe-Grass II MCPA Reglone[3] Stampede CM Stampede 360 Mixes	Reglone[3]	Basagran[1] Buctril M[1] Lontrel MCPA[1] Reglone[3]	Basagran Buctril M 2,4-D[1] Free Flow Hoe-Grass II MCPA Reglone[3] Rival
MUSTARD	Reglone[3]	Reglone[3]	Edge Reglone[3]	Reglone[3]	Reglone[3]	Reglone[3]	Edge[1] Free Flow Reglone[3] Rival Triflurex
SUNFLOWERS	Reglone[3]		Edge Eptam Reglone[3]	Reglone[3]		Reglone[3]	Edge[1] Free Flow Reglone[3] Rival Triflurex

HERBICIDE SELECTOR CHART – FORAGE LEGUMES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	BARLEY (FOXTAIL)	BINDWEED (FIELD)		BLUEBUR	BUCKWHEAT (WILD)	CATCHFLY (NIGHT-FLOWERING)
ALFALFA	SEEDLING	Kerb[4]	Basagran[1,5] Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1]	Laredo (spot)[5] Roundup (spot)[5] SEE Butyric 480[1] Wrangler (spot)[5]		Cobutox 400 2,4-D Butyric 400 Edge[5] Embutox 625 SEE Butyric 480 Treflan	
	ESTABLISHED	Kerb[4] Reglone[3]	Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]	Reglone[3]	Princep[4] Reglone[3] Simazine 80W[4]	Reglone[3] Sencor (irr)[4]
ALSIKE CLOVER	SEEDLING		Basagran[1,5] Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1]	Laredo (spot)[5] Roundup (spot)[5] Tropotox Plus[1] Wrangler (spot)[5]		Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480	
	ESTABLISHED		Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]				
RED CLOVER	SEEDLING		Basagran[1,5] Laredo (spot)[5] Roundup (spot)[5]	Tropotox Plus[1] Wrangler (spot)[5]			
	ESTABLISHED	Reglone[1,3]	Laredo (spot)[5] Reglone[1,3] Roundup (spot)[5] Wrangler (spot)[5]		Reglone[3]	Reglone[3]	Reglone[3]
WHITE DUTCH CLOVER	SEEDLING		Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1] Laredo (spot)[5]	Roundup (spot)[5] Tropotox Plus[1] SEE Butyric 480 Wrangler (spot)[5]		Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480	
	ESTABLISHED	Reglone[1,3]	Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]	Reglone[3]	Reglone[3]	Reglone[3]
SWEET CLOVER	SEEDLING		Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]			Rival Treflan	
	ESTABLISHED		Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]				
BIRD'S-FOOT TREFOIL	SEEDLING	Kerb[4]	Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625 Laredo (spot)[5]	Roundup (spot)[5] SEE Butyric 480[1] Wrangler (spot)[5]		Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480	
	ESTABLISHED	Kerb[4] Reglone[3]	Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]	Reglone[3]	Princep[4] Reglone[3] Simazine 30W[4]	Reglone[3]
SAINFOIN	SEEDLING		Basagran[1,5] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]		Treflan	
	ESTABLISHED		Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]				

HERBICIDE SELECTOR CHART – FORAGE LEGUMES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	CHAMOMILE (SCENTLESS) (SEEDLINGS)	CHICKWEED	CLOVERS	DANDELION	FLIXWEED (SEEDLINGS)	FOXTAIL (GREEN)
ALFALFA	SEEDLING		Basagran[5] Edge[5] Eptam (ppi) Kerb[4] Treflan		Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1]		Edge[5] Eptam (ppi) Hoe-Grass 284[4] Fusilade 250/II[4] Poast[5] Treflan
	ESTABLISHED	Reglone[1,3]	Kerb[4] Reglone[3] Sencor (irr)[4]	Princep[4] Reglone[1,3] Simazine 80W[4]	Reglone[1,3] Velpar[3]	Reglone[3]	Fusilade 250/II[4] Poast[5] Reglone[3]
ALSIKE CLOVER	SEEDLING		Basagran[5]		Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1]		Hoe-Grass 284[5] Poast[5]
	ESTABLISHED						Poast[5]
RED CLOVER	SEEDLING		Basagran[5]				Fusilade 250/II[4] Hoe-Grass 284[4]
	ESTABLISHED	Reglone[1,3]	Reglone[3]	Reglone[1,3]	Reglone[1,3]	Reglone[3]	Fusilade 250/II[4] Reglone[3]
WHITE DUTCH CLOVER	SEEDLING				Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1] SEE Butyric 480[1]		
	ESTABLISHED	Reglone[1,3]	Reglone[3]	Reglone[1,3]	Reglone[1,3]	Reglone[3]	Reglone[3]
SWEET CLOVER	SEEDLING		Rival Treflan				Hoe-Grass 284[4] Poast[5] Rival Treflan
	ESTABLISHED						Poast[5]
BIRD'S-FOOT TREFOIL	SEEDLING		Eptam (ppi) Kerb[4]		Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1] SEE Butyric 480[1]		Eptam (ppi) Fusilade[2]
	ESTABLISHED	Reglone[1,3]	Kerb[4] Reglone[3]	Princep[4] Reglone[1,3] Simazine 80W[4]	Reglone[1,3]	Reglone[3]	Fusilade 250/II[4] Reglone[3]
SAINFOIN	SEEDLING		Basagran[5] Treflan				Hoe-Grass 284[5] Poast[5]
	ESTABLISHED						Treflan Poast[5]

HERBICIDE SELECTOR CHART – FORAGE LEGUMES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	GRASS (BARNYARD)	GRASS (QUACK)		GROUNDSEL (COMMON)	HAWK'S-BEARD (NARROW-LEAVED)
ALFALFA	SEEDLING	Edge[5] Eptam (ppi) Hoe-Grass 284[4] Fusilade 250/II[4] Poast[5] Treflan	Amitrol T (spot)[4] Eptam (ppi)[1] Fusilade[1,4] Kerb[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]	Basagran[5]	Embutox 625 2,4-D Butyric 400 SEE Butyric 480
	ESTABLISHED	Fusilade 250/II[4] Princep[4] Reglone[3] Simazine 80W[4] Sinbar	Amitrol T (spot)[4] Fusilade[1,4] Kerb[4] Laredo (spot)[5] Poast[5]	Reglone[1,3] Roundup (spot)[5] Velpar[5] Wrangler (spot)[5]	Reglone[3] Sencor (irr)[4]	Reglone[1,3]
ALSIKE CLOVER	SEEDLING	Hoe-Grass 284[5] Poast[5]	Amitrol T (spot)[4] Laredo (spot)[4] Poast[5]	Roundup (spot)[5] Wrangler (spot)[5]	Basagran[5]	Embutox 625 2,4-D Butyric 400 SEE Butyric 480
	ESTABLISHED	Poast[5]	Amitrol (spot)[4] Laredo (spot)[5] Poast[5]	Roundup (spot)[5] Wrangler (spot)[5]		
RED CLOVER	SEEDLING	Fusilade 250/II[4] Hoe-Grass 284[4]	Amitrol T (spot)[4] Fusilade 250/II[1,4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]	Basagran[5]	
	ESTABLISHED	Fusilade 250/II[4] Reglone[3]	Amitrol T (spot)[4] Fusilade 250/II[1,4] Laredo (spot)[5]	Reglone[1,3] Roundup (spot)[5] Wrangler (spot)[5]	Reglone[3]	Reglone[1,3]
WHITE DUTCH CLOVER	SEEDLING		Amitrol T (spot)[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot))[5]		Embutox 625 2,4-D Butyric 400
	ESTABLISHED	Reglone[3]	Amitrol T (spot)[4] Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]	Reglone[3]	Reglone[1,3]
SWEET CLOVER	SEEDLING	Hoe-Grass 284[4] Poast[5] Rival Treflan	Amitrol T (spot)[4] Laredo (spot)[5] Poast[5]	Roundup (spot)[5] Wrangler (spot)[5]		
	ESTABLISHED	Poast[5]	Amitrol T (spot)[4] Laredo (spot)[5] Poast[5]	Roundup (spot)[5] Wrangler (spot)[5]		
BIRD'S-FOOT TREFOIL	SEEDLING	Eptam (ppi) Fusilade 250/II[4]	Kerb[4] Eptam (ppi)[1] Fusilade 250/II[1,4]	Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]		Embutox 625 2,4-D Butyric 400 SEE Butyric 480
	ESTABLISHED	Fusilade 250/II[4] Princep[4] Reglone[3] Simazine 80W[4]	Kerb[4] Fusilade[1,4] Laredo (spot)[5]	Reglone[3] Roundup (spot)[5] Wrangler (spot)[5]	Reglone[3]	Reglone[1,3]
SAINFOIN	SEEDLING	Hoe-Grass 284[5] Poast[5] Treflan	Laredo (spot)[5] Poast[5]	Roundup (spot)[5] Wrangler (spot)[5]	Basagran[5]	
	ESTABLISHED	Poast[5]	Laredo (spot)[5] Poast[5]	Roundup (spot)[5] Wrangler (spot)[5]		

HERBICIDE SELECTOR CHART – FORAGE LEGUMES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	KOCHIA	LAMB'S QUARTERS		MUSTARDS	OATS (WILD)	
ALFALFA	SEEDLING	Edge[5]	Basagran[5] Cobutox 400 2,4-D Butyric 400 Edge[5]	Embutox 625 Eptam (ppi) SEE Butyric 480 Treflan	Basagran[5] Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480	Avadex BW[4] Avenge[4] Edge[5] Eptam (ppi) Fusilade 250/II[4]	Hoe-Grass 284[4] Kerb[4] Mataven[5] Poast[5] Treflan
	ESTABLISHED	Reglone[3]	Princep[4] Reglone[3] Sencor (irr)[4] Simazine 80W[4]		Reglone[3] Sencor (irr)[4] Sinbar	Fusilade[4] Kerb[4] Poast[5]	Princep[4] Reglone[3] Simazine 80W[4]
ALSIKE CLOVER	SEEDLING		Basagran[5] Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480 Tropotox Plus		Basagran[5] Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480 Tropotox Plus	Avadex BW[4] Hoe-Grass 284[5] Poast[5]	
	ESTABLISHED					Poast[5]	
RED CLOVER	SEEDLING		Basagran[5] Tropotox Plus		Basagran[5] Tropotox Plus	Avadex BW[4] Avenge[4] Fusilade 250/II[4]	Hoe-Grass 284[4] Mataven[5]
	ESTABLISHED	Reglone[3]	Reglone[3]		Reglone[3]	Fusilade 250/II[4] Reglone[3]	
WHITE DUTCH CLOVER	SEEDLING		Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480 Tropotox Plus		Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480 Tropotox Plus		
	ESTABLISHED	Reglone[3]	Reglone[3]		Reglone[3]	Reglone[3]	
SWEET CLOVER	SEEDLING		Rival Treflan			Avadex BW[4] Avenge[4] Hoe-Grass 284[4]	Poast[5] Rival Treflan
	ESTABLISHED					Poast[5]	
BIRD'S FOOT TREFOIL	SEEDLING		Cobutox 400 2,4-D Butyric 400 Embutox 625	Eptam (ppi) SEE Butyric 480 Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480	Avadex BW[4] Avenge[4] Eptam(ppi) Fusilade 250/II[4]	Kerb[4] Mataven[5]
	ESTABLISHED	Reglone[3]	Princep[4] Reglone[3] Simazine 80W[4]		Reglone[3]	Fusilade 250/II[4] Princep[4] Reglone[3]	Simazine 80W[4] Kerb[4]
SAINFOIN	SEEDLING		Basagran[5] Treflan		Basagran[5]	Hoe-Grass 284[5] Mataven[5]	Poast[5] Treflan
						Poast[5]	

HERBICIDE SELECTOR CHART – FORAGE LEGUMES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	PIGWEED (REDROOT)		SHEPHERD'S-PURSE (SEEDLINGS)	SMARTWEEDS	SOW-THISTLE (PERENNIAL) (continued)	
ALFALFA	SEEDLING	Basagran[1,5] Cobutox 400 2,4-D Butyric 400 Edge[5]	Embutox 625 Eptam (ppi) SEE Butyric 480 Treflan	Basagran[5] Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480	Basagran[5]	Amitrol T (spot)[4] Cobutox 400[1] 2,4-D Butyric 400[1]	Embutox 625[1] Laredo (spot)[5] SEE Butyric 480[1]
	ESTABLISHED	Reglone[3] Sencor (WP)[4]		Reglone[3] Sencor (WP)[4]	Princep[4] Reglone[3] Sencor (WP)[4] Simazine 80W[4]	Amitrol T (spot)[4] Laredo (spot)[5] Reglone (spot)[5]	Roundup (spot)[5] Velpar[5] Wrangler (spot)[5]
ALSIKE CLOVER	SEEDLING	Basagran[1,5] Cobutox 400 2,4-D Butyric 400	Embutox 625 SEE Butyric 480 Tropotox Plus	Basagran[1,5] Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480 Tropotox Plus	Basagran[5]	Amitrol T (spot)[4] Cobutox 400[1] 2,4-D Butyric 400[1]	Embutox 625[1] Laredo (spot)5 SEE Butyric 480[1]
	ESTABLISHED					Amitrol T (spot)[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
RED CLOVER	SEEDLING	Basagran[1,5] Tropotox Plus		Basagran[5] Tropotox Plus	Basagran[5]	Amitrol T (spot)[4] Laredo (spot)[5] Roundup (spot)[5]	
	ESTABLISHED	Reglone[3]		Reglone[3]	Reglone[3]	Amitrol T (spot)[4] Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[3]
WHITE DUTCH CLOVER	SEEDLING	Cobutox 400 2,4-D Butyric 400 Embutox 625	SEE Butyric 480 Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480 Tropotox Plus		Amitrol T (spot)[4] Cobutox 400[1] 2, 4-D Butyric[1] Embutox 625[1]	Laredo (spot)[5] SEE Butyric 480[1] Tropotox Plus[1]
	ESTABLISHED	Reglone[3]		Reglone[3]	Reglone[3]	Amitrol T (spot)[4] Laredo (spot)[5]	Reglone[1,3] Roundup (spot)[5]
SWEET CLOVER	SEEDLING	Rival Treflan				Amitrol T (spot)[4] Laredo (spot)[5] Roundup (spot)[5]	
	ESTABLISHED					Amitrol T (spot)[4] Laredo (spot)[5] Roundup (spot)[5]	
BIRD'S-FOOT TREFOIL	SEEDLING	Cobutox 400 2,4-D Butyric 400 Embutox 625	Eptam (ppi) SEE Butyric 480	Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480		Amitrol T (spot)[4] Cobutox 400[1] 2,4-D Butyric[1]	Embutox 625[1] Laredo (spot)[5] SEE Butyric 480[1]
	ESTABLISHED	Reglone[3]		Reglone[3]	Princep[4] Reglone[3] Simazine 80W[4]	Amitrol T (spot)[4] Laredo (spot)[5] Reglone[3]	Roundup (spot)[5] Wrangler (spot)[5]
SANFOIN	SEEDLING	Basagran[1,5] Treflan		Basagran[5]	Basagran[5]	Amitrol T (spot)[4] Laredo (spot)[5] Roundup (spot)[5]	
	ESTABLISHED					Amitrol T (spot)[4] Laredo (spot)[5]	

HERBICIDE SELECTOR CHART – FORAGE LEGUMES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	SOW THISTLE (PERENNIAL) (continued)	SPURGE (LEAFY)	SPURRY (CORN)	STINKWEED (SEEDLINGS)	THISTLE (CANADA) (continued)	
ALFALFA	SEEDLING	Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]	Amitrol T (spot)[4]	Basagran[5] Edge[5] Eptam (ppi)	Basagran[5] Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480	Amitrol T (spot)[4] Basagran[1,5] Cobutox 400[1] 2,4-D Butyric 400[1]	Embutox 625[1] Laredo (spot)[5] Roundup (spot)[5] SEE Butyric 480[1] Wrangler (spot)[5]
	ESTABLISHED		Amitrol T (spot)[4] Reglone[1,3]	Reglone[3] Sencor (irr)[4]	Reglone[3] Sencor (irr)[4]	Amitrol T (spot)[4] Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]
ALSIKE CLOVER	SEEDLING	Laredo (spot)[5] Roundup (spot)[5] Tropotox Plus[1] Wrangler (spot)[5]	Amitrol T (spot)[4]	Basagran[5]	Basagran[5] Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480 Tropotox Plus	Amitrol T (spot)[4] Basagran[1,5] Cobutox 400[1] Embutox 625[1]	2,4-D Butyric 400[1] Laredo (spot)[5] Roundup (spot)[5] SEE Butyric 480[1] Wrangler (spot)[5]
	ESTABLISHED		Amitrol T (spot)[4]			Amitrol T (spot)[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
RED CLOVER	SEEDLING	Laredo (spot)[5] Roundup (spot)[5] Tropotox Plus[1] Wrangler (spot)[5]	Amitrol T (spot)[4]	Basagran[5]	Basagran[5] Tropotox Plus	Amitrol T (spot)[4] Basagran[1,5] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
	ESTABLISHED		Amitrol T (spot)[4] Reglone[1,3]	Reglone[3]	Reglone[3]	Amitrol T (spot)[4] Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]
WHITE DUTCH CLOVER	SEEDLING	Laredo (spot)[5] Roundup (spot)[5] Tropotox Plus[1] Wrangler (spot)[5]	Amitrol T (spot)[4]		Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480 Tropotox Plus	Amitrol T (spot)[4] Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1]	Laredo (spot)[5] Roundup (spot)[5] SEE Butyric 480[1] Wrangler (spot)[5]
	ESTABLISHED	Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]	Amitrol T (spot)[4] Reglone[1,3]	Reglone[3]	Reglone[3]	Amitrol T (spot)[4] Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]
SWEET CLOVER	SEEDLING	Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]	Amitrol T (spot)[4]			Amitrol T (spot)[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
	ESTABLISHED	Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]	Amitrol T (spot)[4]			Amitrol T (spot)[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
BIRD'S-FOOT TREFOIL	SEEDLING	Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]	Amitrol T (spot)[4]	Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox 625 SEE Butyric 480	Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1] Laredo (spot)[5]	Roundup (spot)[5] SEE Butyric 480[1] Wrangler (spot)[5]
	ESTABLISHED		Amitrol T (spot)[4] Reglone[1,3]	Reglone[3]	Reglone[3]	Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]
SAINFOIN	SEEDLING	Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]	Amitrol T (spot)[4]	Basagran[5]	Basagran[5]	Basagran[1,5] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
	ESTABLISHED	Roundup (spot)[5] Wrangler (spot)[5]	Amitrol T (spot)[4]			Laredo (spot)[5] Roundup (spot)[5] Wrangler (spot)[5]	

HERBICIDE SELECTOR CHART – FORAGE LEGUMES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	THISTLE (CANADA) (continued)	TOADFLAX	
ALFALFA	SEEDLING	Roundup (spot)[5] Wrangler (spot)[5]	Amitrol T (spot)[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
	ESTABLISHED		Amitrol T (spot)[4] Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]
ALSIKE CLOVER	SEEDLING	Roundup (spot)[5] Tropotox Plus[1] Wrangler (spot)[5]	Amitrol T (spot)[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
	ESTABLISHED		Amitrol T (spot)[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
RED CLOVER	SEEDLING	Tropotox Plus[1] Wrangler (spot)[5]	Amitrol T spot[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler(spot)[5]
	ESTABLISHED		Amitrol T (spot)[4] Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]
WHITE DUTCH CLOVER	SEEDLING	Roundup (spot)[5] Tropotox Plus[1] Wrangler (spot)[5]	Amitrol T spot[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler(spot)[5]
	ESTABLISHED	Roundup (spot)[5] Wrangler (spot)[5]	Amitrol T (spot)[4] Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]
SWEET CLOVER	SEEDLING		Amitrol T spot[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler(spot)[5]
	ESTABLISHED	Wrangler (spot)[5]	Amitrol T (spot)[4] Laredo (spot)[5]	Roundup (spot)[5] Wrangler (spot)[5]
BIRD'S-FOOT TREFOIL	SEEDLING	Roundup (spot)[5] Wrangler (spot)[5]	Laredo (spot)[5] Roundup (spot)[5] Wrangler(spot)[5]	
	ESTABLISHED		Laredo (spot)[5] Reglone[1,3]	Roundup (spot)[5] Wrangler (spot)[5]
SAINFOIN	SEEDLING	Wrangler (spot)[5]	Laredo (spot)[5] Roundup (spot)[5] Wrangler(spot)[5]	
	ESTABLISHED	Roundup (spot)[5] Wrangler (spot)[5]	Laredo (spot)[5] Roundup (spot)[5] Wrangler(spot)[5]	

HERBICIDE SELECTOR CHART – FORAGE GRASSES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	BINDWEED (FIELD)		BLUEBUR	BUCKWHEAT (WILD)	
BROME GRASS	SEEDLING	Basagran[1,5] 2,4-D[1] Laredo (spot)	Roundup (spot) Wrangler (spot)	Buctril M 2,4-D	Buctril M 2,4-D amine[1] Pardner	Lontrel Tordon 202C[5]
	ESTABLISHED	2,4-D[1] Lardeo (spot) MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D MCPA amine MCPA ester	Lontrel MCPA amine[1]	MCPA ester[1] Tordon 202C[5]
CRESTED WHEATGRASS	SEEDLING	Basagran[1,5] 2,4-D[1] Laredo (spot)	Roundup (spot) Wrangler (spot)	Buctril M 2,4-D	Buctril M 2,4-D amine[1]	Lontrel Pardner
	ESTABLISHED	2,4-D[1] Laredo (spot) MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D MCPA amine MCPA ester	Lontrel MCPA amine[1] MCPA ester[1]	
INTERMEDIATE WHEATGRASS	SEEDLING	2,4-D[1] Laredo (spot)	Roundup (spot) Wrangler (spot)	Buctril M 2,4-D	Buctril M 2,4-D amine[1]	Lontrel Pardner
FOR SEED ONLY	ESTABLISHED	2,4-D[1] Laredo (spot) MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D MCPA amine MCPA ester	Lontrel MCPA amine[1] MCPA ester[1]	
CREEPING RED FESCUE	SEEDLING	Basagran[1,5] 2,4-D[1] Laredo (spot)	Roundup (spot) Wrangler (spot)	Buctril M 2,4-D	Banvel Buctril M 2,4-D amine[1]	Lontrel Pardner
	ESTABLISHED	2,4 -D[1] Banvel + 2,4-D[1] Laredo (spot) MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D MCPA amine MCPA ester	Banvel MCPA amine[1]	Lontrel MCPA ester[1]
RUSSIAN WILD RYE	SEEDLING	2,4-D[1] Laredo (spot)	Roundup (spot) Wrangler (spot)	Buctril M 2,4-D	Buctril M 2,4-D amine[1]	Lontrel Pardner
	ESTABLISHED	2,4-D[1] Laredo (spot) MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D MCPA amine MCPA ester	Lontrel MCPA amine[1] MCPA ester[1]	
TIMOTHY	SEEDLING	Basagran[1,5] 2,4-D[1] Laredo (spot)	Roundup (spot) Wrangler (spot)	Buctril M 2,4-D	Buctril M 2,4-D amine[1] Lontrel	Pardner Tordon 202C
	ESTABLISHED	2,4-D[1] Laredo (spot) MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D MCPA amine MCPA ester	Lontrel MCPA amine[1]	MCPA ester[1] Tordon 202C
HAY AND GRAZING	WITH LEGUME	Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1]	SEE Butyric 480[1] Tropotox Plus[1]		Cobutox 400 2,4-D Butyric 400	Embutox 625 SEE Butyric 480
	NO LEGUMES	Banvel[1,4] 2,4-D[1,4] MCPA amine[1,4] MCPA ester[1,4]	MCPA Na-salt[1,4] Tropotox Plus[1] Tordon 22K[4]	2,4-D[4] MCPA amine[4] MCPA ester[4] MCPA Na-salt[4]	Banvel 2,4-D[1] MCPA amine[1,4]	MCPA ester[1,4] MCPA Na-salt[1,4]

HERBICIDE SELECTOR CHART – FORAGE GRASSES

1 Suppression only
2 Pre-crop emergence to weed seedlings
3 Used as a crop desiccant
4 Grazing or feeding restrictions
5 Seed production only

CROP	CROP STAGE	CATCHFLY (NIGHT-FLOWERING)	CHAMOMILE (SCENTLESS) (SEEDLINGS)	CHICKWEED (COMMON)	CLEAVERS	CLOVERS	COCKLE (COW)
BROME GRASS	SEEDLING	Buctril M Pardner	Buctril M Lontrel Pardner	Basagran[5]		Lontrel Tordon 202C[5] (Alsike only)	Buctril M Pardner
	ESTABLISHED		Lontrel			Lontrel	
CRESTED WHEATGRASS	SEEDLING	Buctril M Pardner	Buctril M Lontrel Pardner	Basagran[5]		Lontrel	Buctril M Pardner
	ESTABLISHED		Lontrel			Lontrel	
INTERMEDIATE WHEATGRASS	SEEDLING	Buctril M Pardner	Buctril M Lontrel Pardner			Lontrel	Buctril M Pardner
FOR SEED ONLY	ESTABLISHED		Lontrel			Lontrel	
CREEPING RED FESCUE	SEEDLING	Buctril M Pardner	Buctril M Lontrel Pardner	Basagran[5]	Banvel[1]	Banvel Lontrel	Banvel Buctril M Pardner
	ESTABLISHED		Lontrel		Banvel[1]	Banvel Lontrel	Banvel
RUSSIAN WILD RYE	SEEDLING	Buctril M Pardner	Buctril M Lontrel Pardner			Lontrel	Buctril M Pardner
	ESTABLISHED					Lontrel	
TIMOTHY	SEEDLING	Buctril M Pardner	Buctril M Lontrel Pardner	Basagran[5]		Lontrel (Alsike only) Tordon 202C5 (Alsike only)	Buctril M Pardner
	ESTABLISHED		Lontrel			Lontrel (Alsike only)	
HAY AND GRAZING	WITH LEGUME			Kerb[4]			
	NO LEGUMES		Tordon 22K[4]	Kerb[4]	Banvel[4]	Banvel[4]	Banvel[4]

HERBICIDE SELECTOR CHART – FORAGE GRASSES

1. Suppression only
2. Pre-crop emergence to weed seedlings
3. Used as a crop desiccant
4. Grazing or feeding restrictions
5. Seed production only

CROP	CROP STAGE	DANDELION	FLIXWEED (SEEDLINGS)	FOXTAIL (GREEN)	GRASS (BARNYARD)	GRASS (QUACK)
BROME GRASS	SEEDLING	2,4-D[1] Tordon 202C[5]	Buctril M 2,4-D	Hoe Grass 284[4]	Hoe Grass 284[4]	Laredo (spot) Roundup (spot) Wrangler (spot
	ESTABLISHED	2,4-D[1] MCPA amine[1] MCPA ester[1] Tordon 202C[5]	2,4-D MCPA amine MCPA ester			Laredo (spot) Roundup (spot) Wrangler (spot
CRESTED WHEATGRASS	SEEDLING	2,4-D[1]	Buctril M 2,4-D	Hoe Grass 284[4]	Hoe Grass 284[4]	Laredo (spot) Roundup (spot) Wrangler (spot
	ESTABLISHED	2,4-D[1] MCPA amine[1] MCPA ester[1]	2,4-D MCPA amine MCPA ester			Laredo (spot) Roundup (spot) Wrangler (spot
INTERMEDIATE WHEATGRASS	SEEDLING	2,4-D[1]	Buctril M 2,4-D	Hoe Grass 284[4]	Hoe Grass 284[4]	Laredo (spot) Roundup (spot) Wrangler (spot
FOR SEED ONLY	ESTABLISHED	2,4-D[1] MCPA amine[1] MCPA ester[1]	2,4-D MCPA amine MCPA ester			Laredo (spot) Roundup (spot) Wrangler (spot
CREEPING RED FESCUE	SEEDLING	2,4-D[1]	Buctril M 2,4-D	Hoe Grass 284[4] Poast[5]	Hoe Grass 284[4] Poast[5]	Laredo (spot) Poast[5] Roundup (spot) Wrangler (spot)
	ESTABLISHED	2,4-D[1] MCPA amine[1] MCPA ester[1]	2,4-D[1] MCPA amine MCPA ester	Poast[5]	Poast[5]	Laredo (spot) Poast[5] Roundup (spot) Wrangler (spot)
RUSSIAN WILD RYE	SEEDLING	2,4-D[1]	Buctril M 2,4-D	Hoe Grass 284[4]	Hoe Grass 284[4]	Laredo (spot) Roundup (spot) Wrangler (spot
	ESTABLISHED	2,4-D[1] MCPA amine[1] MCPA ester[1]	2,4-D MCPA amine MCPA ester			Laredo (spot) Roundup (spot) Wrangler (spot
TIMOTHY	SEEDLING	2,4-D[1] Tordon 202C[5]	Buctril M 2,4-D			Laredo (spot) Roundup (spot) Wrangler (spot
	ESTABLISHED	2,4-D[1] MCPA amine[1] MCPA ester[1] Tordon 202C[5]	2,4-D MCPA amine MCPA ester			Laredo (spot) Roundup (spot) Wrangler (spot
HAY AND GRAZING	WITH LEGUMES	Cobutox 400[1] 2,4-D Butyric 400[1] Embutox 625[1] SEE Butyric 480[1]				Amitrol T (spot)[4] Karb[4]
	NO LEGUMES	2,4-D[1,4] MCPA amine[1,4] MCPA ester[1,4]	2,4-D[4] MCPA amine[4] MCPA ester[4]			Amitrol T (spot)[4] Karb[4]

HERBICIDE SELECTOR CHART – FORAGE GRASSES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	GROUNDSEL (COMMON)	HAWK'S-BEARD (NARROW-LEAVED)	HEMP-NETTLE	KOCHIA	LAMB'S-QUARTERS	
BROME GRASS	SEEDLING	Basagran[5] Buctril M Pardner	2,4-D[1]		Buctril M 2,4-D Pardner	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]
	ESTABLISHED			MCPA amine[1] MCPA ester[1]	2,4-D MCPA amine MCPA ester	2,4-D MCPA amine	MCPA ester Tordon 202C[5]
CRESTED WHEATGRASS	SEEDLING	Basagran[5] Buctril M Pardner	2,4-D[1]		Buctril M 2,4-D Pardner	Basagran[5] Buctril M	2,4-D Pardner
	ESTABLISHED			MCPA amine[1] MCPA ester[1]	2,4-D MCPA amine MPA ester	2,4-D MCPA amine MCPA ester	
INTERMEDIATE WHEATGRASS	SEEDLING	Buctril M Pardner	2,4-D[1]		Buctril M 2,4-D Pardner	Buctril M 2,4-D Pardner	
FOR SEED ONLY	ESTABLISHED			MCPA amine[1] MCPA ester[1]	2,4-D MCPA amine MCPA ester	2,4-D MCPA amine MCPA ester	
CREEPING RED FESCUE	SEEDLING	Basagran[5] Buctril M Pardner	2,4-D[1]		Buctril M 2,4-D Pardner	Basagran[5] Buctril M 2,4-D Pardner	
	ESTABLISHED			MCPA amine[1] MCPA ester[1]	2,4-D MCPA amine MCPA ester	2,4-D MCPA amine MCPA ester	
RUSSIAN WILD RYE	SEEDLING	Buctril M Pardner	2,4-D[1]		Buctril M 2,4-D Pardner	Buctril M 2,4-D Pardner	
	ESTABLISHED			MCPA amine[1] MCPA ester[1]	2,4-D MCPA amine MCPA ester	2,4-D MCPA amine MCPA ester	
TIMOTHY	SEEDLING	Basagran[5] Buctril M Pardner	2,4-D[1]		Buctril M 2,4-D Pardner	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]
	ESTABLISHED			MCPA amine[1] MCPA ester[1]	2,4-D MCPA amine MCPA ester	2,4-D MCPA amine	MCPA ester Tordon 202C[5]
HAY AND GRAZING	WITH LEGUME		2,4-D Butyric 400 Embutox 625 (Fall spraying) SEE Butyric 480	Tropotox Plus[1]		Cobutox 400 2,4-D Butyric 400 Embutox 625	SEE Butyric 480 Tropotox Plus
	NO LEGUMES		2,4-D[1] (Fall spraying)	MCPA amine[1] MCPA ester[1] MCPA Na-salt[1] Tropotox Plus[1]	2,4-D[4] MCPA amine[4] MCPA ester[4]	2,4-D[4] MCPA amine[4] MCPA ester[4]	MCPA Na-salt[4] Tropotox Plus

HERBICIDE SELECTOR CHART – FORAGE GRASSES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	MUSTARDS		OATS (WILD)	PIGWEED (REDROOT)		SHEPHERD'S-PURSE (SEEDLINGS)	
BROME GRASS	SEEDLING	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Avenge Hoe-Grass 284 Mataven L	Basagran[1,5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Basagran[5] Buctril M 2,4-D	
	ESTABLISHED	2,4-D MCPA amine	MCPA ester Tordon 202C[5]		2,4-D MCPA amine	MCPA ester[1] Tordon 202C[5]	2,4-D MCPA amine MCPA ester	
CRESTED WHEATGRASS	SEEDLING	Basagran[5] Buctril M	2,4-D Pardner	Avenge Hoe-Grass 284 Mataven L	Basagran[1,5] Buctril M 2,4-D Pardner		Basagran[5] Buctril M 2,4-D	
	ESTABLISHED	2,4-D MCPA amine MCPA ester			2,4-D MCPA amine MCPA ester[1]		2,4-D MCPA amine MCPA ester	
INTERMEDIATE WHEATGRASS	SEEDLING	Buctril M 2,4-D Pardner		Hoe-Grass 284 Mataven L	Buctril M 2,4-D Pardner		Buctril M 2,4-D	
FOR SEED ONLY	ESTABLISHED	2,4-D MCPA amine MCPA ester			2,4-D MCPA amine MCPA ester[1]		2,4-D MCPA amine MCPA ester	
CREEPING RED FESCUE	SEEDLING	Basagran[5] Buctril M	2,4-D Pardner	Avenge Hoe-Grass 264 Mataven L Poast[5]	Basagran[1,5] Buctril M 2,4-D Pardner		Basagran[5] Buctril M 2,4-D	
	ESTABLISHED	2,4-D MCPA amine MCPA ester		Poast[5]	2,4-D MCPA amine MCPA ester[1]		2,4-D MCPA amine MCPA ester	
RUSSIAN WILD RYE	SEEDLING	Buctril M 2,4-D Pardner		Avenge Hoe-Grass 284 Mataven L	Buctril M 2,4-D Pardner		Buctril M 2,4-D	
	ESTABLISHED	2,4-D MCPA amine MCPA ester			2,4-D MCPA amine MCPA ester[1]		2,4-D MCPA amine MCPA ester	
TIMOTHY	SEEDLING	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Avenge	Basagran[1,5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Basagran[5] Buctril M 2,4-D	
	ESTABLISHED	2,4-D MCPA amine	MCPA ester Tordon 202C[5]		2,4-D MCPA amine	MCPA ester[1] Tordon 202C[5]	2,4-D MCPA amine MCPA ester	
HAY AND GRAZING	WITH LEGUME	Cobutox 400 2,4-D Butyric 400 Embutox 625	SEE Butyric 480 Tropotox Plus	Kerb[4]	Cobutox 400 2,4-D Butyric 400 Embutox 625	SEE Butyric 480 Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox 625	SEE Butyric 480 Tropotox Plus
	NO LEGUMES	2,4-D[4] MCPA amine[4] MCPA ester[4]	MCPA Na-salt[4] Tropotox Plus	Kerb[4]	2,4-D[4] MCPA amine[4] MCPA ester[4]	MCPA Na-salt[4] Tropotox Plus	2,4-D[4] MCPA amine[4] MCPA ester[4]	MCPA Na-salt[4] Tropotox Plus

HERBICIDE SELECTOR CHART – FORAGE GRASSES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	SMARTWEEDS (ANNUAL)		SOW-THISTLE (PERENNIAL)		SPURGE (LEAFY)		SPURRY (CORN)
BROME GRASS	SEEDLING	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Buctril M[1] 2,4-D[1] Laredo (spot) Lontrel[1]	Roundup (spot) Tordon 202C[1,5] Wrangler (spot)	2,4-D[1]		Basagran[5]
	ESTABLISHED	MCPA amine[1] MCPA ester[1] Tordon 202C[5]		2,4-D[1] Laredo (spot) Lontrel[1] MCPA amine[1]	MCPA ester[1] Roundup (spot) Tordon 202C[1,5] Wrangler (spot)	2,4-D[1] MCPA amine[1] MCPA ester[1]		
CRESTED WHEATGRASS	SEEDLING	Basagran[5] Buctril M	2,4-D Pardner	Buctril M[1] 2,4-D[1] Laredo (spot)	Lontrel[1] Roundup (spot) Wrangler (spot)	2,4-D[1]		Basagran[5]
	ESTABLISHED	MCPA amine[1] MCPA ester[1]		2,4-D[1] Laredo (spot) Lontrel[1] MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D[1] MCPA amine[1] MCPA ester[1]		
INTERMEDIATE WHEATGRASS	SEEDLING	Buctril M 2,4-D Pardner		Buctril 2,4-D[1] Laredo (spot) Lontrel[1]	Lontrel[1] Roundup (spot) Wrangler (spot)	2,4-D[1]		
FOR SEED ONLY	ESTABLISHED	MCPA amine[1] MCPA ester[1]		2,4-D[1] Laredo (spot) Lontrel[1] MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D[1] MCPA amine[1] MCPA ester[1]		
CREEPING RED FESCUE	SEEDLING	Banvel Basagran[5] Buctril M	2,4-D Pardner	Banvel[1] Buctril M 2,4-D[1] Laredo (spot)	Lontrel[1] Roundup (spot) Wrangler (spot)	2,4-D[1]		Banvel Basagran[5]
	ESTABLISHED	Banvel MCPA amine[1] MCPA ester[1]		Banvel[1] 2,4-D[1] Laredo (spot) Lontrel[1]	MCPA amine[1] MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D[1] MCPA amine[1] MCPA ester[1]		Banvel
RUSSIAN WILD RYE	SEEDLING	Buctril M 2,4-D Pardner		Buctril M[1] 2,4-D[1] Laredo (spot) Lontrel[1]	Roundup (spot) Tordon 202C[1,5] Wrangler (spot)	2,4-D[1]		
	ESTABLISHED	MCPA amine[1] MCPA ester[1]		2,4-D[1] Laredo (spot) Lontrel[1]	MCPA[1] Roundup (spot) Wrangler (spot)	2,4-D[1] MCPA amine[1] MCPA ester[1]		
TIMOTHY	SEEDLING	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Buctril M[1] 2,4-D[1] Laredo (spot) Lontrel[1]	Roundup (spot) Tordon 202C[1,5] Wrangler (spot)	2,4-D[1]		Basagran[5]
	ESTABLISHED	MCPA amine[1] MCPA ester[1] Tordon 202C[5]		2,4-D[1] Laredo (spot) Lontrel[1] MCPA amine[1]	MCPA ester[1] Roundup (spot) Tordon 202C[1,5] Wrangler (spot)	2,4-D[1] MCPA amine[1] MCPA ester[1]		
HAY AND GRAZING	WITH LEGUME	Cobutox 400[1] 2,4-D Butyric 400[1]	Embutox 625[1] SEE Butyric 480[1]	Amitrol T (spot)[4] Cobutox 400[1] 2,4-D Butyric 400[1]	Embutox 625[1] SEE Butyric 480[1] Tropotox Plus[1]	Amitrol T (spot)[4]		
	NO LEGUMES	Banvel[4] 2,4-D[4] MCPA amine[1,4]	MCPA ester[1,4] MCPA Na-salt[4]	Amitrol T (spot) Banvel[1,4] Banvel + 2,4-D[1,4] 2,4-D[1,4] MCPA amine[1,4]	MCPA ester[1,4] MCPA Na-salt[1,4] Tropotox Plus[1] Tordon 22K[4]	Amitrol T (spot)[4] 2,4-D[1,4] MCPA amine[1,4]	MCPA ester[1,4] MCPA Na-salt[1,4] Tordon 22K[4]	Banvel[4]

HERBICIDE SELECTOR CHART – FORAGE GRASSES

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only

CROP	CROP STAGE	STINKWEED (SEEDLINGS)		THISTLE (CANADA)		THISTLE (RUSSIAN)		TOADFLAX
BROME GRASS	SEEDLING	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Buctril M[1] 2,4-D[1] Laredo (spot) Lontrel	Roundup (spot) Tordon 202C[1,5] Wrangler	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Laredo (spot) Roundup (spot) Wrangler (spot)
	ESTABLISHED	2,4-D MCPA amine	MCPA ester Tordon 202C[5]	2,4-D[1] Laredo (spot) Lontrel MCPA amine[1]	MCPA ester[1] Roundup (spot) Tordon 202C[1,5] Wrangler (spot)	2,4-D Tordon 202C[5]		Laredo (spot) Roundup (spot) Wrangler (spot)
CRESTED WHEATGRASS	SEEDLING	Basagran[5] Buctril M	2,4-D Pardner	Buctril M[1] 2,4-D[1] Laredo (spot)	Lontrel Roundup (spot) Wrangler	Basagran[5] Buctril M	2,4-D Pardner	Laredo (spot) Roundup (spot Wrangler (spot)
	ESTABLISHED	2,4-D MCPA amine MCPA ester		2,4-D[1] Laredo (spot) Lontrel MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D		Laredo (spot) Roundup (spot) Wrangler (spot)
INTERMEDIATE WHEATGRASS	SEEDLING	Buctril M 2,4-D Pardner		Buctril M[1] 2,4-D[1] Laredo (spot)	Lontrel Roundup (spot) Wrangler	Buctril M 2,4-D Pardner		Laredo (spot) Roundup (spot) Wrangler (spot)
FOR SEED ONLY	ESTABLISHED	2,4-D MCPA amine MCPA ester		2,4-D[1] Laredo (spot) Lontrel MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D		Laredo (spot) Roundup (spot) Wrangler (spot)
CREEPING RED FESCUE	SEEDLING	Basagran[5] Buctril M	2,4-D Pardner	Banvel[1] Buctril M[1] 2,4-D[1] Laredo(spot)	Lontrel Roundup (spot) Wrangler (spot)	Basagran[5] Buctril M	2,4-D Pardner	Laredo (spot) Roundup (spot) Wrangler (spot)
	ESTABLISHED	2,4-D MCPA amine MCPA ester		Banvel[1] 2,4-D[1] Laredo (spot) Lontrel	MCPA amine[1] MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D		Laredo (spot) Roundup (spot) Wrangler (spot)
RUSSIAN WILD RYE	SEEDLING	Buctril M 2,4-D Pardner		Buctril M[1] 2,4-D[1] Laredo (spot)	Lontrel Roundup (spot) Wrangler	Buctril M 2,4-D Pardner		Laredo (spot) Roundup (spot) Wrangler (spot)
	ESTABLISHED	2,4-D MCPA amine MCPA ester		2,4-D[1] Laredo (spot) Lontrel MCPA amine[1]	MCPA ester[1] Roundup (spot) Wrangler (spot)	2,4-D		Laredo (spot) Roundup (spot) Wrangler (spot)
TIMOTHY	SEEDLING	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Buctril M[1] 2,4-D[1] Laredo (spot) Lontrel	Roundup (spot) Tordon 202C[1,5] Wrangler (spot)	Basagran[5] Buctril M 2,4-D	Pardner Tordon 202C[5]	Laredo (spot) Roundup (spot) Wrangler (spot)
	ESTABLISHED	2,4-D MCPA amine	MCPA ester Tordon 202C[5]	2,4-D[1] Laredo (spot) Lontrel MCPA amine[1]	MCPA ester[1] Roundup (spot) Tordon 202C[1,5] Wrangler (spot)	2,4-D Tordon 202C[5]		Laredo (spot) Roundup (spot) Wrangler (spot)
HAY AND GRAZING	WITH LEGUME	Cobutox 400 2,4-D Butyric 400 Embutox 625	SEE Butyric 480 Tropotox Plus	Amitrol T (spot) Cobutox 400[1] 2,4 -D Butyric 400[1]	Embutox 625[1] SEE Butyric 480[1] Tropotox Plus[1]			Amitrol T (spot)[4] Laredo (spot) Roundup (spot) Wrangler (spot)
	NO LEGUMES	2,4-D[4] MCPA amine[4] MCPA ester[4]	MCPA Na-salt[4] Tropotox Plus	Amitrol T (spot)[4] Banvel[1,4] Banvel+ 2,4-D[1,4] 2,4-D[1,4] MCPA amine[1,4]	MCPA ester[1,4] MCPA Na-salt[1,4] Tropotox Plus[1] Tordon 22K[4]	2,4-D[4]		Amitrol T (spot)[4] Tordon 22K[4]

HERBICIDE SELECTOR CHART – OTHER CROPS

[1] Suppression only
[2] Pre-emergence to crop, post emergent to weeds
[3] Used as a crop desiccant

	BUCKWHEAT (TARTARY	BUCKWHEAT (WILD)		CATCHFLY (NIGHT-FLOWERING)	CHICKWEED (COMMON)	
BEANS (SNAP AND DRY)	Gramoxone[2] Reglone[3]	Edge Gramoxone[2] Reglone[3]	Rival 500EC Treflan Triflurex	Reglone[3]	Basagran Edge Eptam Gramoxone[2] Patoran	Reglone[3] Rival 500EC Treflan Triflurex
CANARY SEED	Banvel Buctril M Pardner Stampede CM Target	Banvel Buctril M Pardner	Stampede CM Target	Buctril M Pardner Target		
CARROTS (C) AND PARSNIPS	Gramoxone[2]	Afolan F Gramoxone[2] (C) Linuron 400L	Lorox (C) Rival (C) Treflan (C)	Gramoxone[2] (C)	Afolan F Lorox (C) Linuron 400L	Rival 500EC (C) Treflan (C)
CORN Check label to ensure chosen chemical or mix is registered for use on the crop. **FIELD CORN ONLY (FC)**	Banvel Buctril M 2,4-D[1] Gramoxone[2] MCPA amine (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC) Kil-Mor Lentagran + Atrazine Pardner	Afolan F Atrazine Banvel (FC) Bladex Buctril M Cobutox 400 (FC) 2,4-D[1] 2,4-D Butyric 400 (FC) Embutox 625 (FC) Gramoxone[2] Kil-Mor	Lentagran + Atrazine Lorox L (FC) MCPA amine[1] (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC) Pardner Primextra Princep Simazine 80W Sutan + Mixes	Buctril M Gramoxone[1,2] Pardner	Afolan F Basagran Eradicane 8-E Gramoxone[1,2]	Laddok Lorox L (FC) Princep Simazine 80W
FABABEANS	Lexone + Treflan	Edge Free Flow Rival 500EC	Treflan Triflurex		Advance 10G Basagran Edge Free Flow Lexone + Treflan	Rival 500EC Sencor + Treflan Treflan Triflurex
LENTILS	Reglone[3] Sencor	Free Flow Reglone[3]	Rival Treflan	Reglone[3] Sencor	Advance 10G Free Flow Reglone[3]	Rival Sencor Treflan
PEAS (Field and Processing) Check label to ensure chosen chemical or mix is registered for use on the crop.	Gramoxone[2] Lexone DF MCPA amine[1] MCPA Na-salt[1] Reglone[3] Sencor	Advance 10G Edge Free Flow Gramoxone[2] MCPA amine[1]	MCPA Na-salt[1] Reglone[3] Rival Treflan Triflurex	Gramoxone[1,2] Reglone[3] Sencor	Advance 10G Basagran Edge Free Flow Gramoxone[2] Lexone DF	Reglone[3] Rival Sencor Treflan Triflurex
POTATOES	Gramoxone[2] Lexone (WP) Reglone[3] Sencor (WP)	Afolan F Gramoxone[2] Linuron 400L	Lorox Reglone[3]	Gramoxone[2] Reglone[3] Sencor	Afolan F Eptam (Irish) Gramoxone[2] Lexone (WP) Linuron 400L	Lorox Patoran Reglone[3] Sencor (WP)
RUTABAGAS	Gramoxone[2]	Gramoxone[2]		Gramoxone[2]	Eptam Gramoxone[2]	
TAME BUCKWHEAT						

HERBICIDE SELECTOR CHART – OTHER CROPS

[1] Suppression only
[2] Pre-emergence to crop, post emergent to weeds
[3] Used as a crop desiccant

	COCKLEBUR	COCKLE (COW)	DARNEL (PERSIAN)	FOXTAIL (GREEN)
BEANS (SNAP AND DRY)	Basagran Gramoxone[2] Reglone[3]	Edge Gramoxone[2] Reglone[3] Rival 500EC Treflan Triflurex	Gramoxone[2] Hoe-Grass 284 Poast Reglone[3] Rival 500EC Treflan Triflurex	Edge Eptam Gramoxone[2] Hoe-Grass 284 Patoran Poast Reglone Rival 500EC Treflan Triflurex
CANARY SEED	Buctril M MCPA amine MCPA ester	Banvel Buctril M Pardner Target		Stampede CM
CARROTS (C) AND PARSNIPS	Gramoxone[2] (C)	Gramoxone[2] (C) Rival (C) Treflan (C)	Gramoxone[2] (C) Hoe-Grass 284 (C) Rival 500EC (C) Treflan (C)	Afolan F Gramoxone[2] (C) Hoe-Grass 284 (C) Linuron 400L[1] Lorox (C) Rival 500EC (C) Treflan (C)
CORN Check label to ensure chosen chemical or mix is registered for use on the crop. **FIELD CORN ONLY (FC)**	Basagran Buctril M Cobotox 400 (FC) 2,4-D 2,4-D Butyric (FC) Embutox 625 (FC) Gramoxone[2] Kil-Mor Laddok MCPA amine[1] (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC)	Banvel (FC) Buctril M Gramoxone[2] (C) Kil-Mor Pardner	Gramoxone[2] (C)	Afolan F Atrazine Bladex Dual & Mixes Eradicane 8-E Gramoxone[2] Lentagran + Atrazine Lorox L[1] (FC) Primextra Sutan+
FABABEANS	Basagran	Advance 10G Edge Free Flow Rival 500EC Treflan Triflurex	Advance 10G Edge Free Flow Hoe-Grass 284 Poast Rival 500EC Treflan Triflurex	Advance 10G Edge Free Flow Hoe-Grass 284 Poast Rival 500EC Treflan Triflurex
LENTILS	Reglone[3]	Advance 10G Free Flow Reglone[3] Rival Treflan	Advance 10G Free Flow Hoe-Grass 284 Poast Reglone[3] Rival Treflan	Advance 10G Excel Free Flow Hoe-Grass 284 Poast Reglone[3] Rival Treflan
PEAS (Field and Processing) Check label to ensure chosen chemical or mix is registered for use on the crop.	Basagran Gramoxone[2] MCPA amine[1] MCPA Na-salt[1] Reglone[3]	Advance 10G Edge Free Flow Gramoxone[2] Reglone[3] Rival Treflan Triflurex	Advance 10G Free Flow Gramoxone[2] Hoe-Grass 284 Poast Reglone[3] Rival Treflan Triflurex	Advance 10G Edge Excel Free Flow Gramoxone[2] Hoe-Grass 284 NaTA (Field) Poast Reglone[3] Rival Treflan Triflurex
POTATOES	Gramoxone[2] Reglone[3]	Gramoxone[2] Reglone[3]	Gramoxone[2] Reglone[3]	Afolan F Dual & Mixes Eptam (Irish) Excel Fusilade Gramoxone[2] Hoe-Grass 284 Linuron 400L[1] Lorox[1] Patoran Poast Reglone[3]
RUTABAGAS	Gramoxone[2]	Gramoxone[2]	Gramoxone[2]	Eptam Gramoxone[2]
TAME BUCKWHEAT			Hoe-Grass 284 Poast	Excel Hoe-Grass 284 Poast

HERBICIDE SELECTOR CHART – OTHER CROPS

[1] Suppression only
[2] Pre-emergence to crop, post emergent to weeds
[3] Used as a crop desiccant

	GOOSEFOOT	GRASS (BARNYARD)		GRASS (QUACK)	GROUNDSEL (COMMON)	HEMP-NETTLE
BEANS (SNAP AND DRY)	Gramoxone[2] Reglone[3]	Edge Eptam Gramoxone[2] Hoe Grass 284 Patoran	Poast Reglone[3] Rival 500EC Treflan Triflurex	Amitrol-T (white bean) Eptam Poast Reglone[3]	Basagran Gramoxone[2] Patoran Reglone[3]	Gramoxone[2] Reglone[3] Edge[1]
CANARY SEED					Buctril M Pardner	Target
CARROTS (C) AND PARSNIPS	Afolan F Gramoxone[2] (C) Linuron 400L Lorox (C)	Afolan F Gramoxone[2] (C) Hoe Grass 284 Linuron 400L	Lorox (C) Rival 500EC (C) Treflan	Gramoxone[2] (C)	Afolan F Gramoxone[2] (C) Linuron 400L	Gramoxone[2] (C)
CORN Check label to ensure chosen chemical or mix is registered for use on the crop. **FIELD CORN ONLY (FC)**	Afolan F Bladex Cobutox 400 (FC) 2,4-D amine 2,4-D Butyric 400 (FC) Embutox 625 (FC) Gramoxone[2] Lorox (FC) MCPA amine[1] MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC) SEE Butyric 480 (FC)	Afolan F Atrazine Bladex Dual & Mixes Eradicane 8-E Gramoxone[2]	Lentagran + Atrazine Lorox L (FC) Primextra Princep Sutan+	Amitrol-T Eradicane 8-E Gramoxone[2]	Afolan F Basagran Buctril M Gramoxone[2] Laddok Pardner	Gramoxone[2] MCPA amine[1] (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC
FABABEANS		Advance 10G Edge Free Flow Hoe-Grass 284	Poast Reglone[3] Rival 500EC Treflan	Poast	Basagran Sencor + Treflan	Edge Lexone + Treflan Sencor + Treflan
LENTILS	Reglone[3]	Advance 10G Excel Free Flow Hoe-Grass 284	Poast Reglone[3] Rival Treflan	Reglone[3] Poast	Reglone[3] Sencor	Reglone[3] Sencor
PEAS (Field and Processing) Check label to ensure chosen chemical or mix is registered for use on the crop.	Gramoxone[2] MCPA amine[1] MCPA Na-salt[1] Reglone[3]	Advance 10G Edge Excel Free Flow Gramoxone[2] Hoe-Grass 284	Poast Reglone[3] Rival Treflan Triflurex	NaTA (Field) Gramoxone[2] Poast Reglone[3]	Basagran Gramoxone[2] Reglone[3] Sencor	Edge[1] Gramoxone[2] Lexone DF MCPA amine[1] MCPA Na-salt[1] Reglone[3] Sencor Tropotox[1]
POTATOES	Afolan F Gramoxone[2] Linuron 400L Lorox Reglone[3]	Afolan F Dual & Mixes Eptam (Irish) Excel Fusilade Gramoxone[2]	Hoe-Grass 284 Linuron 400L Lorox Patoran Poast Reglone[3]	Eptam (Irish) Fusilade Gramoxone[2] Poast Reglone[3]	Afolan F Gramoxone[2] Linuron 400L Patoran Reglone[3] Sencor (WP)	Gramoxone[2] Lexone (WP) Reglone[3] Sencor (WP)
RUTABAGAS	Gramoxone[2]	Eptam Gramoxone[2]		Eptam Gramoxone[2]	Gramoxone[2]	Gramoxone[2]
TAME BUCKWHEAT		Excel Hoe-Grass Poast		Poast		

HERBICIDE SELECTOR CHART – OTHER CROPS

[1] Suppression only
[2] Pre-emergence to crop, post emergent to weeds
[3] Used as a crop desiccant

	KNOTWEED	KOCHIA	LAMB'S-QUARTERS		MUSTARDS (CONTINUED)	
BEANS (SNAP AND DRY)	Gramoxone[2] Reglone[3] Rival 500EC Treflan Triflurex	Edge Gramoxone[2] Reglone[3]	Basagran Edge Eptam Gramoxone[2] Patoran	Reglone[3] Rival 500EC Treflan Triflurex	Basagran Gramoxone[2]	Patoran Reglone[3]
CANARY SEED	Target	Buctril M Pardner Stampede CM Target	Banvel + MCPA Buctril M Pardner	Stampede CM Target	Buctril M Pardner	Stampede CM Target
CARROTS (C) AND PARSNIPS	Afolan F Lorox (C) Gramoxone[2] (C) Linuron 400L Rival (C) Treflan (C)	Afolan F Gramoxone[2] (C) Linuron 400L	Afolan F Gramoxone[2] (C) Linuron 400L Lorox (C)	Rival (C) Treflan (C) Triflurex (C)	Afolan F Gramoxone[2] (C)	Linuron 400L Lorox (C)
CORN Chcek label to ensure chosen chemical or mix is registered for use on the crop. **FIELD CORN** ONLY (FC)	Afolan F Bladex Gramoxone[2] Kil-Mor Lorox L (FC)	Afolan F Bladex Buctril M 2,4-D Gramoxone[2] MCPA amine (FC) MCPA K-salt (FC) Pardner	Afolan F Atrazine Basagran Bladex Buctril M Cobotox 400 (FC) 2,4-D 2,4-D Butyric 400 (FC) Embutox 625 (FC) Eradicane 8-E Gramoxone[2] Kil-Mor	Laddok Lentagran + Atrazine Lorox L (FC) MCPA amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Pardner Primextra Princep SEE Butyric 480 (FC) Sutan[+] + Atrazine Sutan[+] + Bladex Tropotox Plus (FC)	Afolan F Atrazine Banvel + 2,4-D (FC) Basagran Bladex Buctril M Cobutox 400 (FC)	2,4-D 2,4-D Butyric 400 (FC) Embutox 625 (FC) Gramoxone[2] Lentagran + Atrazine SEE Butyric 480 (FC)
FABABEANS	Advance 10G Free Flow Rival 500EC Treflan Triflurex	Edge	Advance 10G Basagran Edge Free Flow Lexone + Treflan	Rival 500EC Sencor + Treflan Treflan Triflurex	Basagran Lexone + Treflan Sencor + Treflan	
LENTILS	Advance 10G Free Flow Reglone[3] Rival Treflan	Reglone[3]	Advance 10G Free Flow Reglone[3]	Rival Sencor Treflan	Reglone[3] Sencor	
PEAS (Field and Processing) Check label to ensure chosen chemical or mix is registered for use on the crop.	Advance 10G Free Flow Gramoxone[2] Reglone[3] Rival Treflan Triflurex	Edge Gramoxone[2] MCPA amine Reglone[3]	Advance 10G Basagran Edge Free Flow Gramoxone[2] Lexone DF (Field) MCPA amine	MCPA Na-salt Reglone[3] Rival Sencor Treflan Triflurex Tropotox Plus	Basagran Gramoxone[2] Lexone DF MCPA amine MCPA N-salt	Reglone[3] Sencor Treflan Tropotox Plus
POTATOES	Afolan F Gramoxone[2] Linuron 400L Lorox Reglone3	Afolan F Gramoxone[2] Linuron 400L Reglone[3]	Afolan F Amiben 10G Eptam (Irish) Gramoxone[2] Lexone (WP)	Linuron 400L Lorox Patoran Reglone[3] Sencor (WP)	Afolan F Amiben 10G Gramoxone[2] Lexone (WP) Linuron 400L	Lorox Patoran Reglone[3] Sencor (WP)
RUTABAGAS	Gramoxone[2]	Gramoxone[2]	Eptam Gramoxone[2]		Gramoxone[2]	
TAME BUCKWHEAT						

HERBICIDE SELECTOR CHART – OTHER CROPS

[1] Suppression only
[2] Pre-emergence to crop, post emergent to weeds
[3] Used as a crop desiccant

	MUSTARDS (CONTINUED)	NIGHTSHADE (AMERICAN, BLACK, HAIRY)	OATS (WILD, VOL.)	PIGWEED (PROSTRATE)	PIGWEED (REDROOT) (CONTINUED)
BEANS (SNAP AND DRY)		Basagran (Hairy) Edge[1] (American, Black) Eptam (Hairy) Gramoxone[2] Patoran (Black) Reglone[3]	Edge Eptam Hoe-Grass 284 Gramoxone[2] Poast Reglone[3] Rival 500EC Treflan Triflurex	Edge Eptam Gramoxone[2] Patoran Reglone[3] Rival 500EC Treflan Triflurex	Basagran Edge Eptam Gramoxone[2] Patoran Reglone[3] Rival 500EC Treflan Triflurex
CANARY SEED		Buctril M (American) Pardner (American, Black)	Avenge Mataven L	Target	Banvel + MCPA Buctril M Pardner Stampede CM Target
CRARROTS (C) AND PARSNIPS		Gramoxone[2] (C)	Gramoxone[2] (C) How-Grass 284 (C) Rival 500EC (C) Treflan (C)	Afolan F Gramoxone[2] (C) Linuron 400L Rival 500EC Treflan (C)	Afolan F Gramoxone[2] (C) Linuron 400L
CORN Chcek label to ensure chosen chemical or mix is registered for use on the crop. **FIELD CORN ONLY (FC)**	Laddok Lorox L (FC) MCPA amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Pardner Primextra Sutan[+] + Atrazine Sutan + Bladex	Basagran (Hairy) Bladex (Black) Buctril M (American) Dual & Mixes Eradicane 8-E (Hairy) Gramoxone[2] Laddok (Black) Lentagran + Atrazine Pardner (American, Black) Primextra (American)	Atrazine Eradicane 8-E Gramoxone[2] Princep Simazine 80W	Afolan F Bladex 2,4-D Eradicane 8-E Gramoxone[2] Kil-Mor MCPA-K (FC) Primextra	Afolan F Atrazine Basagran[1] Bladex Buctril M Cobutox 400 (FC) 2,4-D 2,4-D Butyric 400 Embutox 625 (FC) Eradicane 8-E Gramoxone[2] Lentagran + Atrazine SEE Butyric 480 (FC)
FABABEANS		Basagran (Hairy) Edge[1] (American, Black)	Advance 10G Edge Free Flow Hoe-Grass 284 Poast Rival 500EC Treflan Triflurex	Advance 10G Edge Free Flow Rival 500EC Treflan Triflurex	Advance 10G Basagran[1] Edge Free Flow Lexone + Treflan Rival 500EC Sencor + Treflan Treflan Triflurex
LENTILS		Reglone[3]	Excel Hoe-Grass 284 Poast Reglone[3] Rival Treflan	Advance 10G Free Flow Reglone[3] Rival Treflan	Advance 10G Free Flow Reglone[3] Rival Sencor Treflan
PEAS (Field and Processing) Check label to ensure chosen chemical or mix is registered for use on the crop.		Basagran (Hairy) Edge[1] (American, Black) Gramoxone[2] Reglone[3]	Advance 10G Avadex BW Edge Excel Free Flow Gramoxone[2] Hoe-Grass 284 Poast Reglone[3] Rival Treflan Triflurex	Advance 10G Edge Free Flow Gramoxone[2] Reglone[3] Rival Treflan Triflurex	Advance 10G Basagran[1] Edge Free Flow Gramoxone[2] Lexone DF (Field) MCPA amine MCPA Na-salt Reglone[3] Rival Sencor
POTATOES		Dual & Mixes Eptam (Hairy) Gramoxone[2] Patoran (Black) Reglone[3]	Eptam (Irish) Excel Fusilade Gramoxone[2] Hoe-Grass 284 Poast Reglone[3]	Afolan F Eptam (Irish) Gramoxone[2] Linuron 400L Patoran Reglone[3]	Afolan F Eptam (Irish) Gramoxone[2] Lexone (WP) Linuron 400L Lorox Patoran Reglone[3] Sencor (WP)
RUTABAGAS		Eptam (Hairy) Gramoxone[2]	Eptam Gramoxone[2]	Eptam Gramoxone[2]	Eptam Gramoxone[2]
TAME BUCKWHEAT			Poast Hoe-Grass 284		

HERBICIDE SELECTOR CHART – OTHER CROPS

[1] Suppression only
[2] Pre-emergence to crop, post emergent to weeds
[3] Used as a crop desiccant

	PIGWEED (REDROOT) (CONTINUED)	PIGWEED (RUSSIAN)	PURSLANE		RADISH (WILD)	RAPESEED VOLUNTEER
BEANS (SNAP AND DRY)		Reglone[3]	Basagran[1] Edge Eptam Excel Gramoxone[2] Hoe-Grass 284	Patoran Poast Reglone[3] Rival 500EC Treflan Trifurex	Basagran Gramoxone[2] Reglone[3]	Gramoxone[2] Reglone[3]
CANARY GRASS					Banvel + MCPA	Buctril M Stampede CM Target
CARROTS (C) AND PARSNIPS	Lorox (C) Rival (C) Treflan (C)	Gramoxone[2] (C)	Afolan F Gramoxone[2] (C) Linuron 400L	Lorox (C) Rival 500EC (C) Treflan	Afolan F Gramoxone[2] (C) Linuron 400L	Gramoxone[2]
CORN Check label to ensure chosen chemical or mix is registered for use on the crop. **FIELD CORN ONLY (FC)**	Kil-Mor Laddok Lorox L (FC) MCPA amine (FC) MCPA K-salt MCPA Na-salt Pardner Primextra Sutan[+] + Atrazine Tropotox Plus (FC)	2,4-D Gramoxone[2] MCPA amine (FC) MCPA K-salts (FC) MCPA Na-salt (FC)	Afolan F Atrazine Basagran Bladex 2,4-D Eradicane 8-E Gramoxone[2] Laddok Lentagran + Atrazine	Lorox L (FC) MCPA amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Primextra Princep Simazine 80W Sutan[+] + Atrazine Sutan[+] + Bladex	Afolan F Basagran[1] Cobutox 400 2,4-D Gramoxone[2] MCPA amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Tropotox Plus (FC)	Buctril M Gramoxone[2] Tropotox Plus (FC)
FABA BEANS			Advance 10G Basagran Edge Free Flow	Rival 500EC Treflan Trifurex	Basagran	Lexone + Treflan Sencor + Treflan
LENTILS		Reglone[3]	Advance 10G Free Flow Reglone[3]	Rival Treflan	Basagran Gramoxone[2] MCPA amine MCPA Na-salt Reglone[3] Tropotox Plus	Reglone[3] Sencor
PEAS (Field and Processing) Check label to ensure chosen chemical or mix is registered for use on the crop.	Treflan Trifurex Tropotox Plus	Gramoxone[2] MCPA amine MCPA Na-salt Reglone[3]	Advance 10G Basagran Edge Free Flow Gramoxone[2] MCPA amine	MCPA Na-salt Reglone[3] Rival Treflan Trifurex	Reglone[3]	Gramoxone[2] Lexone DF (Field) Reglone[3] Sencor Tropotox Plus
POTATOES		Reglone[3]	Afolan F Eptam (Irish) Gramoxone[2] Linuron 400L Lorox Patoran Reglone[3]		Afolan F Gramoxone[2] Linuron 400L Reglone[3]	Gramoxone[2] Lexone (WP) Reglone[3] Sencor (WP)
RUTABAGAS		Gramoxone[2]	Eptam Gramoxone[2]		Gramoxone[2]	Gramoxone[2]
TAME BUCKWHEAT						

HERBICIDE SELECTOR CHART – OTHER CROPS

[1] Suppression only
[2] Pre-emergence to crop, post emergent to weeds
[3] Used as a crop desiccant

	SMARTWEEDS (ANNUAL)		SOW-THISLES (ANN. & PER.)		SPURRY (CORN)	STINKWEED	
BEANS (SNAP AND DRY)	Amiben Basagran Edge	Gramoxone[2] Patoran Reglone[3]	Gramoxone[2] Reglone[3]		Basagran Edge Eptam Gramoxone[2] Patoran Reglone[3]	Basagran Gramoxone[2]	Patoran Reglone[3]
CANARY GRASS	Banvel Buctril M Pardner	Stampede CM Target	Banvel[1] (Per) Buctril M[1] (Per) MCPA[1] (All)	Target (Ann) Target[1] (Per)	Banvel MCPA K-salt Target	Buctril M Pardner	Stampede CM Target
CARROTS (C) AND PARSNIPS	Afolan F Gramoxone[2] (C)	Linuron 400L Lorox (C)	Afolan F (Seedling) (Per) Gramoxone[2] (C)	Linuron 400L (Seedling only) Lorox (C) (Ann)	Afolan F Gramoxone[2] (C) Linuron 400L	Afolan F Gramoxone[2] (C) Linuron 400L Lorox (C)	
CORN Check label to ensure chosen chemical or mix is registered for use on the crop. **FIELD CORN ONLY (FC)**	Afolan F Atrazine Banvel Basagran Cobutox 400[1] (FC) 2,4-D 2,4-D Butyric 400 Embutox 625 (FC) Gramoxone[2] Kil-Mor Laddok	Lentagran + Atrazine Lorox L (FC) MCPA amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Pardner Primextra SEE Butyric 480 (FC) Sutan[+] + Atrazine Tropotox Plus (FC)	Afolan F (Seedling) (Per) Amitrol T (Spot) Banvel (FC))Per) Buctril M[1] (Per) Cobutox 400[1] (FC) 2,4-D[1] 2,4-D Butyric 400[1] (FC)	Embutox 625[1] (FC) Gramoxone[2] Kil-Mor (Ann) Lorox L (Ann) MCPA[1] (FC) MCPA K-salt (FC) SEE Butyric 480 (FC) Tropotox Plus (FC)	Afolan F Banvel (FC) Basagran Eradicane 8-E Gramoxone[2] Kil-Mor Laddok MCPA K-salt	Afolan F Banvel + 2,4-D Basagran Buctril M Cobutox 400[1] (FC) 2,4-D 2,4-D Butyric 400 Embutox 625 (FC)	Kil-Mor Lorox L (FC) MCPA amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Pardner SEE Butyric 480 (FC) Tropotox Plus (FC)
FABABEANS	Basagran Edge	Lexone + Treflan Sencor + Treflan			Basagran Edge Sencor + Treflan Lexone + Treflan	Basagran Sencor + Treflan Lexone + Treflan	
LENTILS	Reglone[3] Sencor		Reglone[3]		Reglone[3] Sencor	Reglone[3] Sencor	
PEAS (Field and Processing) Check labels to ensure chosen chemical or mix is registered for use on the crop.	Basagran[1] Edge[1] Gramoxone[2] Lexone DF (Field) MCPA amine	MCPA Na-salt Reglone[3] Sencor Tropotox Plus	Amitrol T (Spot) Gramoxone[2] MCPA amine[1] MCPA Na-salt[1] Reglone[3] Tropotox Plus[1]		Basagran Edge Gramoxone[2] Lexone DF (Field) Reglone[3] Sencor	Basagran Gramoxone[2] Lexone DF (Field) MCPA amine	MCPA Na-salt Reglone[3] Sencor Tropotox Plus
POTATOES	Afolan F Gramoxone[2] Lexone (WP) Linuron 400L	Lorox Patoran Reglone[3] Sencor (WP)	Afolan F (Seedling) (Per) Gramoxone[2] Linuron 400L (Seedling only) Lorox L (Ann) Reglone3		Afolan F Eptam (Irish) Gramoxone[2] Lexone (WP) Linuron 400L Patoran Reglone[3] Sencor (WP)	Afolan F Gramoxone[2] Lexone (WP) Linuron 400L	Lorox Patoran Reglone[3] Sencor (WP)
RUTABAGAS	Gramoxone[2]		Gramoxone[2]		Eptam Gramoxone[2]	Gramoxone[2]	
TAME BUCKWHEAT							

HERBICIDE SELECTOR CHART – OTHER CROPS

[1] Suppression only
[2] Pre-emergence to crop, post emergent to weeds
[3] Used as a crop desiccant

	THISTLE (CANADA)		THISTLE (RUSSIAN)		VOLUNTEER CEREALS	
BEANS (SNAP AND DRY)	Amitrol T (Spot) Basagran[1]	Gramoxone[1,2] Reglone[3]	Basagran Gramoxone[2] Reglone[3]	Rival 500EC Treflan Triflurex	Edge Eptam Gramoxone[2]	Poast Reglone[3]
CANARY GRASS	Banvel + MCPA[1] Buctril M[1] Target		Buctril M Target Pardner			
CARROTS (C) AND PARSNIPS	Gramoxone[2] (C)[1]		Gramoxone[2] (C) Rival 500EC (C)		Gramoxone[2] (C)	
CORN Check label to ensure chosen chemical or mix is registered for use on the crop. **FIELD CORN** ONLY (FC)	Amitrol (Spot) Banvel[1] Basagran[1] Buctril M[1] Cobutox 400[1] (FC) 2,4-D[1] 2,4-D Butyric[1] (FC) Embutox 625[1] (FC)	Gramoxone[1,2] Kil-Mor[1] MCPA amine[1] (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC) SEE Butyric 480 (FC) Tropotox Plus[1] (FC)	Basagran Bladex Buctril M 2,4-D	Gramoxone[2] Kil-Mor Laddok Pardner	Eradicane 8-E Gramoxone[2]	
FABABEANS	Basagran[1] Sencor + Treflan[1]		Advance 10G Basagran[1] Edge Free Flow	Rival Sencor + Treflan[1] Treflan Triflurex	Edge Poast	
LENTILS	Reglone[3] Sencor		Advance 10G Free Flow Reglone[3]	Rival Sencor Treflan	Poast Reglone[3]	
PEAS (Field and Processing) Check label to ensure chosen chemical or mix is registered for use on the crop.	Amitrol T (Spot) Basagran[1] Gramoxone[1,2] MCPA amine[1]	MCPA Na-salt[1] Reglone[3] Sencor[1] Tropotox Plus[1]	Basagran Edge Free Flow Gramoxone[2] Reglone[3]	Rival Sencor Treflan Triflurex	Edge Gramoxone[2] Poast Reglone[3]	
POTATOES	Gramoxone[2] Reglone[3]		Gramoxone[2] Reglone[3] Sencor (WP)		Eptam (Irish) Fusilade Gramoxone[2]	Poast Reglone[3]
RUTABAGAS	Gramoxone[2]		Gramoxone[2]		Eptam Gramoxone[2]	
TAME BUCKWHEAT					Poast	

INSECTICIDE SELECTOR CHART

NOTE:
Insecticides Listed by trade name
[1] Insect suppression only

	BEETLES BLISTER BEETLES	COLORADO POTATO BEETLE	FLEA BEETLES	RED TURNIP BEETLE	WEEVILS (SWEET CLOVER, ALFALFA)	WIREWORMS
BARLEY, OATS, WHEAT						Lindane
RYE						Lindane
FIELD CORN (FC) **SWEET CORN (SC)**			Dyfonate			Counter Dyfonate Lindane
ALFALFA	Sevin	Dibrom	Sevin		APM Cygon Decis[1] Furadan Guthion Lagon Malathion Sevin Supracide	
CLOVER	Sevin	Dibrom	Sevin		Cygon Guthion Malathion Sevin	
PASTURE		Dibrom				
CANOLA			APM Counter Cymbush Decis Furadan Guthion Lindane Malathion Ripcord Sevin Supracide	Furadan Guthion Supracide		
FLAX						Lindane
MUSTARD			Counter Cymbush Decis Furadan Lindane Malathion Supracide	Furadan Supracide		
SUNFLOWER						
SUGARBEETS		Dibrom	APM Guthion Malathion			Counter Lindane
PEAS						Lindane
POTATO		Ambush APM Cymbush Decis Diazinon Dibrom Endosulfan 400 Furadan Guthion Lorsban Malathion Monitor Pounce Ripcord Sevin Supracide Temik Thimet Thiodan	Ambush APM Cymbush Decis Diazinon Dyfonate Endosulfan 400 Furadan Lannate Lorsban Monitor Pounce Ripcord Sevin Supracide Thimet Thiodan			Dyfonate Thimet[1]

INSECTICIDE SELECTOR CHART

NOTE:
Insecticides listed by trade name
† Insect suppression only

	ALFALFA LOOPER	ARMYWORMS	*BERTHA ARMYWORM OR CLOVER CUTWORM	BEET WEBWORM	CUTWORMS ARMY, RED-BACKED PALE WESTERN	DIAMOND-BACK MOTH LARVAE	*EUROPEAN CORN BORER OR **CORN EARWORM
BARLEY, OATS, WHEAT		Dylox Guthion Lannate Lorsban Malathion Sevin			Ambush Decis Lorsban Ripcord (B,W)		
RYE		Dylox Guthion Lorsban Malathion Sevin			Ambush		
FIELD CORN (FC) **SWEET CORN (SC)**		Dylox Lannate (FC) Sevin			Ambush Lorsban Ripcord		Ambush Cymbush Decis† (FC) Endosulfan 400 Furadan* Lannate (SC) Malathion (FC) Pounce (SC) Ripcord Sevin Thiodan**
ALFALFA		Dylox Sevin		Dylox Sevin			
CLOVER		Sevin		Sevin			
PASTURE							
CANOLA	Lannate Lorsban	Lorsban	Cymbush* Decis Lannate* Lorsban* Monitor* Ripcord* *Bertha Armyworm only	Dylox Lannate	Ambush Lorsban	APM Decis Dylox Guthion Lorsban Malathion Supracide	
FLAX		Dylox	Lannate	Dylox	Ambush Decis Lorsban		
MUSTARD			Cymbush Decis		Lorsban	Decis Malathion Supracide	
SUNFLOWER					Ambush Lorsban		
SUGARBEETS		Dylox			Ambush Lorsban		
PEAS	Lindane				Ambush		
POTATO					Ambush Lorsban Ripcord		

INSECTICIDE SELECTOR CHART

NOTE:
Insecticides Listed by trade name
[1] Insect suppression only

	BUTTERFLIES AND MOTHS		FLIES	GRASSHOPPERS		PLANT BUGS		STORED GRAIN INSECTS
	FLAX BOLLWORM	THISTLE BUTTERFLY (PAINTED LADY)	ROOT MAGGOT (SEED CORN, SUGAR BEET)	(CLEAR WINGED, MIGRATORY, TWO-STRIPED)		ALFALFA, SUPERB, STINK, LYGUS, TARNISHED		FLOUR BEETLES, GRAIN BEETLES, MEDITERRANEAN FLOUR MOTH
BARLEY, OATS, WHEAT				Cygon Decis Furadan Guthion Lorsban	Malathion Ripcord (B.W) Sevin			Gastoxin Malathion
RYE				Guthion Malathion Sevin				Gastoxin Malathion
FIELD CORN (FC) SWEET CORN (SC)			Diazinon Dylonate	Furadan Sevin				Gastoxin (FC) Malathion (FC)
ALFALFA				Cygon Furadan Guthion	Lagon Malathion Sevin	Cygon Decis Dylox Endosulfan 400 Guthion	Lagon Malathion Supracide Thiodan	
CLOVER				Cygon Furadan Guthion	Malathion Sevin	Cygon Guthion Malathion		
PASTURE				Cygon Decis Diazinon	Furadan Malathion Sevin	Cygon		
CANOLA				Cygon Furadan Lorsban Malathion	Monitor Ripcord Sevin			
FLAX	Lannate			Decis Furadan Malathion				
MUSTARD				Furadan Malathion				
SUNFLOWER		Supracide						
SUGARBEETS			Counter Furadan Temik					
PEAS								
POTATO				Cygon Lagon		Ambush APM Cymbush Decis Endosulfan 400 Furadan	Guthion Lorsban Pounce Ripcord Supracide Thiodan	

INSECTICIDE SELECTOR CHART

NOTE:
Insecticides Listed by trade name
[1] Insect suppression only

	SUCKING INSECTS					THRIPS
	APHIDS (CORN LEAF, GREEN BUG, GREEN PEACH, ENGLISH GRAIN, PEA, RUSSIAN)		LEAFHOPPERS (POTATO)		SPITTLEBUGS	BARLEY, GRASS, RED CLOVER
BARLEY, OATS, WHEAT	Cygon Malathion Lorsban					Cygon Lannate Malathion
RYE	Cygon Malathion					
FIELD CORN (FC) SWEET CORN (SC)	Endosulfan 400 Pirimor (SC) Thiodan					
ALFALFA	APM Cygon Endosulfan 400 Guthion	Lagon Malathion Supracide Thiodan	APM Cygon Guthion	Malathion Sevin Supracide	APM Endosulfan 400 Guthion Malathion Thiodan	
CLOVER	APM Cygon		APM Cygon		APM Endosulfan 400 Guthion Malathion Thiodan	
PASTURE	Cygon		APM Cygon			
CANOLA						
FLAX						
MUSTARD						
SUNFLOWER						
SUGARBEETS	Thiodan					
PEAS	Cygon Lagon	Lannate Pirimor				
POTATO	APM Cygon Diazinon Furadan Guthion Lannate Lagon	Malathion Monitor Pirimor Temik Thimet Thiodan	Ambush APM Cygon Cymbush Decis Diazinon Furadan Guthion Lagon Lannate	Malathion Monitor Pounce Ripcord Sevin Supracide Temik Thimet Thiodan	APM Guthion	

Pesticide Application Record

Field Description: _____ Acres: _____ Crop: _____

Variety: _____ Date seeded: _____ Fertilizer _____ Rate _____ Date _____

Crop Stage: _____ Scouting Date: _____ Date Results Were Checked: _____

Pest Weed/Insect/Disease		Density				Results	Field Diagram
Species	Leaf stage/Instar/Symptom	Patches	Low	Medium	High		

Comments: _____

_____

Application Information							Environment Information			
Pesticide Used	Date and time	Rate per acre	Water volume per acre	Acres per tank	Herbicide volume per tank	Tanks per field	Crop stand	Soil moisture	Temp-erature	Wind speed and direction
1 Lot #: _____							Ex..... G. ..... Fr. ..... Pr.	Ex..... G. ..... Fr. ..... Pr.		
2 Lot #: _____							Ex..... G. ..... Fr. ..... Pr.	Ex..... G. ..... Fr. ..... Pr.		
3 Lot #: _____							Ex..... G. ..... Fr. ..... Pr.	Ex..... G. ..... Fr. ..... Pr.		

Comments: _____

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Note: Ex. = Excellent G. = Good Fr. = Fair Pr. = Poor

Pesticide Application Record

Field Description: _____ Acres: _____ Crop: _____

Variety: _____ Date seeded: _____ Fertilizer: _____ Rate: _____ Date: _____

Crop Stage: _____ Scouting Date: _____ Date Results Were Checked: _____

Pest Weed/Insect/Disease		Density				Results	Field Diagram
Species	Leaf stage/Instar/Symptom	Patches	Low	Medium	High		

Comments: _____

_____

Application Information							Environment Information			
Pesticide Used	Date and time	Rate per acre	Water volume per acre	Acres per tank	Pesticide volume per tank	Tanks per field	Crop stand	Soil moisture	Temp-erature	Wind speed and direction
1 Lot #: _____							Ex..... G..... Fr..... Pr.....	Ex..... G..... Fr..... Pr.....		
2 Lot #: _____							Ex..... G..... Fr..... Pr.....	Ex..... G..... Fr..... Pr.....		
3 Lot #: _____							Ex..... G..... Fr..... Pr.....	Ex..... G..... Fr..... Pr.....		

Comments: _____

_____

_____

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Note: Ex. = Excellent G. = Good Fr. = Fair Pr. = Poor

Pesticide Application Record

Field Description: _____ Acres: _____ Crop: _____

Variety: _____ Date seeded: _____ Fertilizer: _____ Rate: _____ Date: _____

Crop Stage: _____ Scouting Date: _____ Date Results Were Checked: _____

Pest Weed/Insect/Disease		Density				Results	Field Diagram
Species	Leaf stage/Instar/Symptom	Patches	Low	Medium	High		

Comments: _____

_____

Application Information							Environment Information			
Pesticide Used	Date and time	Rate per acre	Water volume per acre	Acres per tank	Pesticide volume per tank	Tanks per field	Crop stand	Soil moisture	Temp-erature	Wind speed and direction
1 Lot #: _____							Ex. ..... G. ..... Fr. ..... Pr.	Ex. ..... G. ..... Fr. ..... Pr.		
2 Lot #: _____							Ex. ..... G. ..... Fr. ..... Pr.	Ex. ..... G. ..... Fr. ..... Pr.		
3 Lot #: _____							Ex. ..... G. ..... Fr. ..... Pr.	Ex. ..... G. ..... Fr. ..... Pr.		

Comments: _____

_____

_____

_____

Note: Ex. = Excellent G. = Good Fr. = Fair Pr. = Poor

Pesticide Application Record

Field Description: _____ Acres: _____ Crop: _____

Variety: _____ Date seeded: _____ Fertilizer: _____ Rate: _____ Date: _____

Crop Stage: _____ Scouting Date: _____ Date Results Were Checked: _____

Pest Weed/Insect/Disease		Density				Results	Field Diagram	
Species	Leaf stage/Instar/Symptom	Patches	Low	Medium	High			

Comments: _____

_____

Application Information							Environment Information			
Pesticide Used	Date and time	Rate per acre	Water volume per acre	Acres per tank	Pesticide volume per tank	Tanks per field	Crop stand	Soil moisture	Temp-erature	Wind speed and direction
1 Lot #: _____							Ex. ..... G. ..... Fr. ..... Pr.	Ex. ..... G. ..... Fr. ..... Pr.		
2 Lot #: _____							Ex. ..... G. ..... Fr. ..... Pr.	Ex. ..... G. ..... Fr. ..... Pr.		
3 Lot #: _____							Ex. ..... G. ..... Fr. ..... Pr.	Ex. ..... G. ..... Fr. ..... Pr.		

Comments: _____

_____

_____

_____

Note: Ex. = Excellent G. = Good Fr. = Fair Pr. = Poor

Pesticide Application Record

Field Description: _____ Acres: _____ Crop: _____

Variety: _____ Date seeded: _____ Fertilizer: _____ Rate: _____ Date: _____

Crop Stage: _____ Scouting Date: _____ Date Results Were Checked: _____

Pest Weed/Insect/Disease		Density				Results	Field Diagram	
Species	Leaf stage/Instar/Symptom	Patches	Low	Medium	High			

Comments: _____

_____

Application Information							Environment Information			
Pesticide Used	Date and time	Rate per acre	Water volume per acre	Acres per tank	Pesticide volume per tank	Tanks per field	Crop stand	Soil moisture	Temperature	Wind speed and direction
1 Lot #: _____							Ex. ..... G. ..... Fr. ..... Pr.	Ex. ..... G. ..... Fr. ..... Pr.		
2 Lot #: _____							Ex. ..... G. ..... Fr. ..... Pr.	Ex. ..... G. ..... Fr. ..... Pr.		
3 Lot #: _____							Ex. ..... G. ..... Fr. ..... Pr.	Ex. ..... G. ..... Fr. ..... Pr.		

Comments: _____

_____

_____

_____

Note: Ex. = Excellent G. = Good Fr. = Fair Pr. = Poor

TRIPLE RINSING

RINSE FOR DOLLARS
RINSE FOR SAFETY
RINSE FOR DISPOSAL

Triple rinsing renders used pesticide containers (metal, plastic, glass) more than 99 per cent free of residues in most cases.

Steps to follow:

1. Empty contents of the container into the spray tank and drain in a vertical position for 30 seconds.
2. Add water to container to about 1/5 full.
3. Shake the container thoroughly and empty into the spray tank.
4. Repeat the procedure two more times, it should only take about 5 minutes in total.
5. Triple rinsed containers should be punctured or broken to render them non-reusable. Paper bags should be rinsed once prior to disposal.
6. Dispose of containers in an approved pesticide disposal site.